REMOTE CONTROL

# PRACTICAL TELEVISION

AND TELEVISION TIMES


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EDITOR F. J. CAMM

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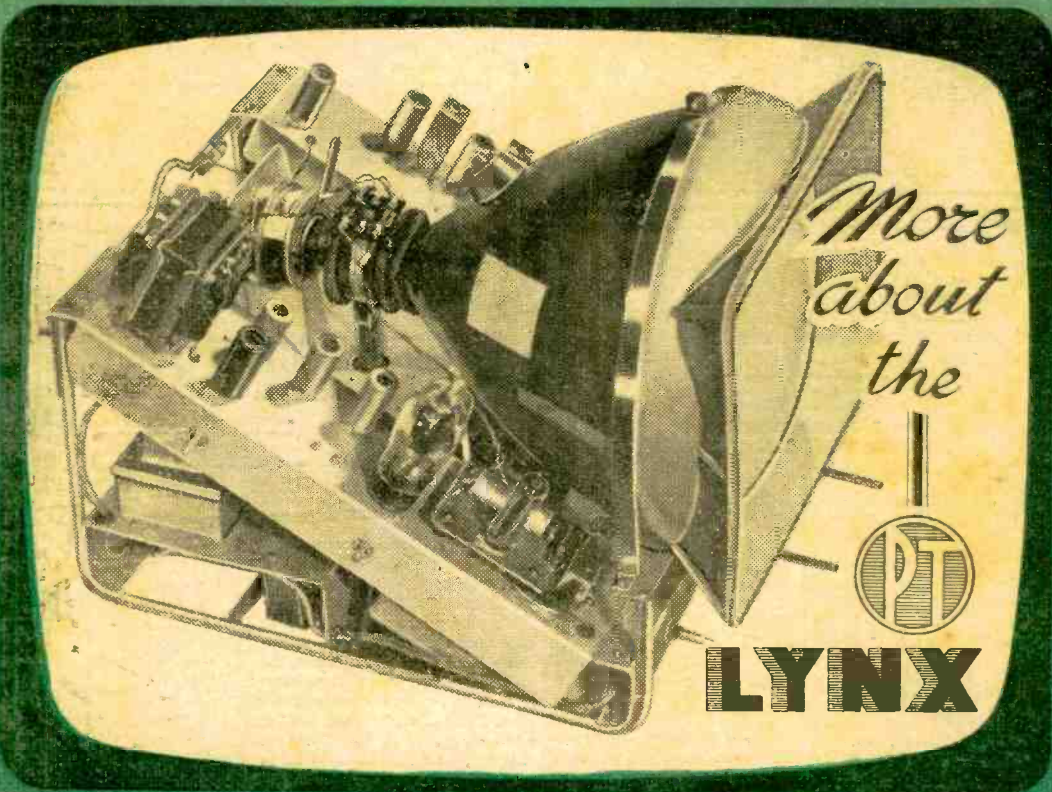


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# PRACTICAL TELEVISION

& "TELEVISION TIMES"

Editor: F. J. CAMM

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***TELEVIEWS***

## Coronation TV Relay to Europe

FOLLOWING the very successful relay of a British TV programme through a France-Belgium-Holland hook-up as an advance Coronation test, a statement has been jointly issued by the BBC, Radiodiffusion-Television Francais, the Belgian National Broadcasting Corporation, the Dutch Television Foundation and the North-western German Broadcasting organisation. The statement says: "In December, 1952, I.N.R., N.T.S. and N.W.D.R. agreed to work out plans with the BBC and R.T.F. who, encouraged by the results obtained during the Franco-British Week in July, 1952, considered that tests should be carried out with the object of relaying to television stations on the Continent of Europe the BBC television broadcasts of the Coronation ceremony. It was considered desirable that full-scale tests should be carried out before the end of April and these tests took place during the week April 20th-26th inclusive. During the week, the normal BBC transmissions have been used for these tests and have been watched in the countries concerned."

The results are considered to have been satisfactory and there is every reason to hope, therefore, that successful transmission will be possible on June 2nd. It is expected that the following transmitters on the Continent of Europe will relay the BBC television broadcast of the Coronation ceremonies: France (Paris, Lille), Holland (Lopik, Eindhoven), Western Germany (Cologne, Langenburg, Hanover, Hamburg, Berlin, Frankfurt, Weinbiet).

### TEST CARD C

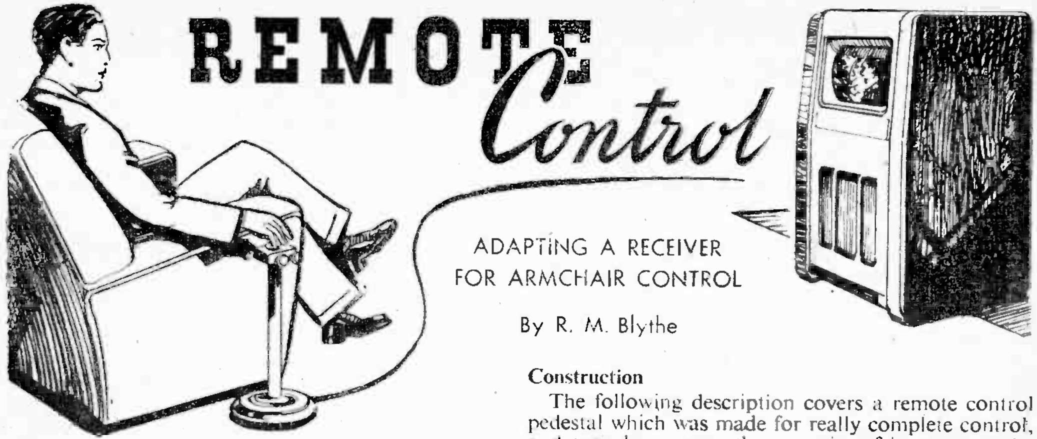
BEARING in mind that about 350,000 home-built television receivers are in operation in this country, it is astonishing that the BBC continues to ignore the demand made in this and other journals on a number of occasions during the past two years for further transmission time for Test Card C. It is from this band of skilled experimenters will be found the radar operators and technical personnel required by the Services and industry. The BBC would be doing a national service in granting this further transmission time. It is true that, as from March 16th, BBC morning transmissions have been extended for one hour and that this will continue until June 10th, and that the extra hour from 12 noon until 1 p.m. consists of Test Card C with 440 c/s tone on the sound channel. The BBC have acknowledged the importance of giving "all possible assistance in this matter;" but they say that the limit of transmission time has been reached and that any permanent increase must involve the recruitment of engineering staff for night maintenance shifts. They say that this is impracticable because of the high cost. They also say that existing engineering personnel resources are stretched to the limit. Of course, the extra transmission time was granted to assist the industry in coping with circumstances connected with the Coronation. We insist, however, that these excuses do not satisfy us and once again we enter a plea for a permanent increase in Test Card C time, especially at this stage of television development.

### TV AND STIFF NECKS

THE opticians have had their say concerning the possible effect of television on eyesight and it was too much to hope that the doctors would lie low! Not to be outdone by the opticians an American medical journal warns doctors to watch for television torticollis, which is a nice high-falutin name for stiff neck "caused by uncomfortable viewing." After all, the doctors must cash in somewhere! To make our blood curdle the journal says: "The rapidly increasing extent to which television is being adopted in Britain may well produce a crop of such cases." Surely they meant "*ill*" instead of "well," although it will possibly be well for the doctors!

Doctors are advised to instruct the public that the set is so placed that the family can view "without nuchal (nape of the neck) contortions." We suggest that doctors would be better occupied in finding a cure for the common cold. Was it not the doctors, when the motor car was first produced, who said that no human being could possibly travel at a speed of 60 miles an hour without dropping dead due to heart failure? Doctors have always adopted a stupid attitude towards scientific developments.—F. J. C.

# REMOTE Control



ADAPTING A RECEIVER FOR ARMCHAIR CONTROL

By R. M. Blythe

NUMEROUS suggestions have been made from time to time concerning the use of a remote contrast control, in order to make more easy work of adjusting a television receiver for picture fading. This usually takes the form of an attenuator in the aerial lead, or maybe the gain control of the pre-amplifier, if one is in use.

However, particularly in the more distant or fringe areas, the contrast or gain control brought out to one's armchair is just not sufficient; all controls that require frequent adjustment should be available at the remote point, in so far as one decides to have any at all. At the same time, of course, no control should be made remote unless fully justified, as the number of cables run over the floor may be intolerable, let alone inconvenient.

Now although the requirements will vary from one place to another—in fact, they may vary for each individual installation—the contrast, brilliance, volume, both frame and line holds, and possibly focus and vision suppressor controls should cover the complete requirements of even the worst cases.

**Implications**

Perhaps the chief objection to an armchair control is the necessity for having cables run across the floor of your room, followed by the possible pick up of interference on the leads, or instability, etc.

At first glance a potentiometer used as such requires three leads brought out, and when used as a variable resistance it will require two leads. Now as all potentiometers and variable resistances will probably have one end earthed to chassis, a common earth return could cut down the number of cables, but still leaves far too many. For example, the first five controls mentioned above may require seven leads plus one common, which is rather a lot to have spread over the floor. It is possible though, by using a very simple method of connection, to use only one cable per control, regardless of whether it is a potentiometer or a variable resistance. It also provides the additional advantage of being able to operate the receiver from the remote point, or at the set itself, without any changeover complications being involved.

**Construction**

The following description covers a remote control pedestal which was made for really complete control, and entirely removes the necessity of journeys to the receiver.

In order to get a general picture of the unit, the specification is as follows:

Six remote controls available, viz.: contrast, brilliance, volume, both frame and line holds, and vision suppressor. Connection by six standard ¼in. diameter, 80 ohm co-axial cables; entry into the receiver being effected by plugs and sockets. Control available at both ends, without any changeover devices. Entire circuit fully screened. Minimum of modification to the receiver.

(The vision suppressor was deemed necessary owing to the need to ease it off when signal strength increased.)

To commence with the electrical side, those controls in the receiver which are just variable resistances are simply connected in series with the corresponding remote variable resistance; those which are potentiometers in the receiver can have their earthed end disconnected, and fed through the remote control, which is just a variable resistance. This gives control at both ends in both cases. Fig. 1 shows the scheme for the potentiometers, whilst Fig. 2 shows the more physical arrangement. The value of each remote control may be the same as that in the set, but the range covered can be altered by changing the value a little.

It will be seen then, that the centre lead of each

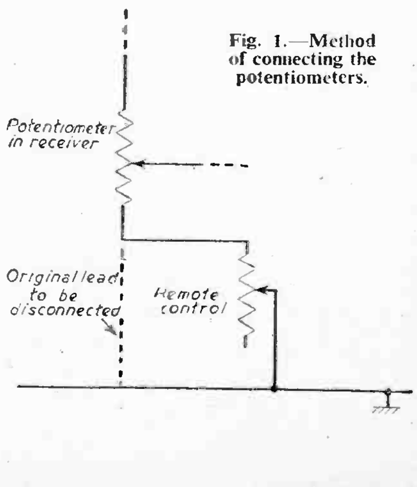



**Fig. 1.—Method of connecting the potentiometers.**

cable can be taken to the remote end, with the screen forming the earth or, more correctly, the chassis return. Each cable has its own separate return lead, therefore, rather than one common to all. This method gives complete freedom from any instability or other undesirable effects. The screens of the cables are not connected to the metal-work of the pedestal, as this metalwork would then be connected to the receiver chassis, which may be alive at mains voltage.

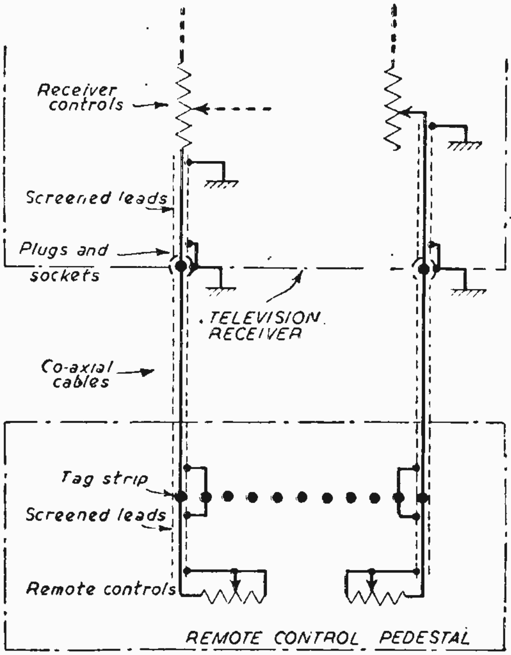



**Fig. 2.—Physical arrangement of connections, showing a potentiometer and variable resistance.**

The construction of the pedestal itself comprises an aluminium tube for the column, with an "Eddystone" die-cast alloy box for mounting the potentiometers, the two being joined together by a suitable flange, preferably also made of aluminium. The lid of the box is uppermost.

A turned and polished wooden base at the bottom keeps the unit upright; it must be large enough to prevent the pedestal being knocked over too easily. It is necessary to add three small feet under this base, to allow sufficient clearance for the cables to come out. The feet may be of wood or any convenient knob that serves the purpose. The general arrangement shown in Fig. 3 should make the details clear, and dimensions quoted are as found desirable by experience in use.

The cables are best terminated on a tag strip mounted inside the die-cast box, flexible screened leads being used to connect from the tag strip to the potentiometers, and of sufficient length for those mounted on the lid to allow easy removal of the lid for inspection. Mention was made earlier of not connecting any screens to the metal box. Two ways are available to prevent these screened leads accidentally touching. The box can be lined with an insulating sheet, or Systoflex may be slipped over the screened leads. This latter method was used in the pedestal made, but the former is the more reliable.

The cables are brought down the tube and out underneath the wooden base, where a piece of ¼in. thick insulating material acts as a spacer and keeps them horizontal and firmly fixed. A number of similar spacers—⅛in. thick is sufficient in this case—are required for sliding over the cables at intervals of 1ft. or so, in order to keep them flat on the floor and in a tidy and organised manner. The length of the cables from receiver to pedestal is not at all critical, but 5 to 6yds. will be sufficient for normal rooms. Remember, though, as much as 1½yds. will be needed to pass round to the rear of the televisor cabinet.

The appearance of the pedestal can be improved by adding a mottled finish to the aluminium work, as is often used on this metal; also a piece of black Traffolite glued to the lid top (and also held by the potentiometer fixing nuts) will improve appearances further. Ivory white knobs, suitably engraved for purpose, make the unit quite attractive.

There are several shapes and forms this unit could take, but the arrangement described is designed to effect a compromise between the conventional methods of housing radio equipment and the

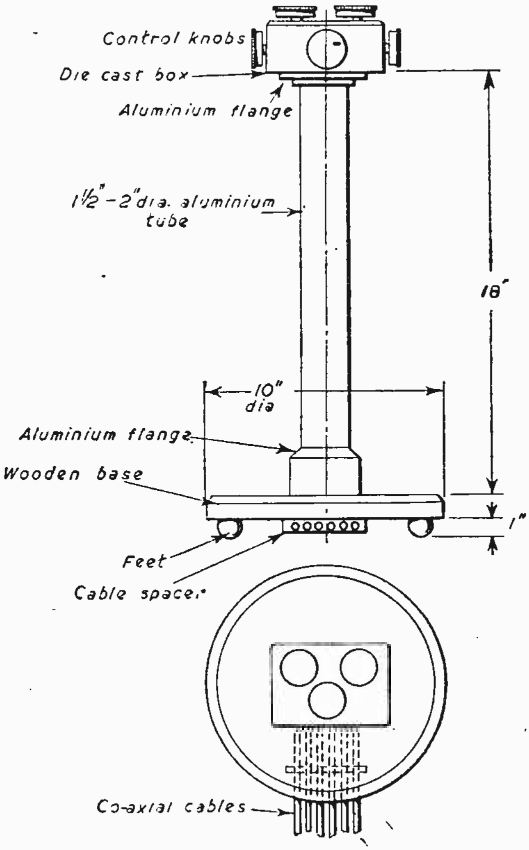



**Fig. 3.—General arrangement of the pedestal.**

appearance requirements of a furnished room. It is also economical in time, work and cost.

**Modifications to Receiver**

The alteration to the receiver wiring is as small as could be expected. Simply disconnect the side of the potentiometer which goes to chassis and bring it out, via screened cable, to a "Belling-Lee" co-axial socket. The socket is best mounted on the rear vertical surface of the chassis, and in so doing automatically forms the chassis return connection. It is advisable to earth the screen of the connecting leads at both ends, and keep them as short as possible, and away from each other, as well as other existing leads.

If the potentiometer happens to be in series with another component before reaching the chassis, it will be necessary to bring it to the chassis end of the chain. If, however, it is not possible to do this, it is quite likely still possible to use the co-axial cable screen for the return lead, but the socket on the receiver chassis will then have to be insulated from the chassis. Care will also be necessary to see that the screen in question inside the die-cast box does not touch the others. The Systoflex method will help here.

Failing this alternative, a separate co-axial cable to the pedestal will have to be used.

To complete the job, add the co-axial plugs to the cables, not forgetting to slip on the cable spacers first.

**Operation**

No troubles have been experienced from instability or pick up of hum, etc., as the wiring is fully screened. A unit made to this specification has been in use for several months with a "Viewmaster," using three stages of pre-amplification.

To use the unit for the first time, set all controls on it to their mid position, then switch on the televisor and adjust the controls until normal operation is restored. Some adjustments can be made at the remote end if the setting required at the receiver now lies outside its range, some adjustment available in both directions at both ends being the ideal position.

For regular operation, the procedure is to switch on the receiver and make initial adjustments there, then take over at the remote end. When closing down for the night, leave the remote controls alone, and reduce to zero those at the receiver, or leave all as they are if it is your usual policy.

It will be found an enormous advantage to have complete control of the televisor from your armchair, and to eliminate the annoying disturbances when having to approach the receiver for adjustments, particularly as many of the controls are often buried at the back of the cabinet.

After the finish of the night's viewing, the pedestal is simply put at the side of the receiver, and the cables neatly folded up. The spacers will prevent any serious entanglements. If at any time it is desired to dispense with the remote accessory, pull out the plugs, and short the centre terminal of the socket to chassis, then readjust the receiver controls to original settings.

# The Coronation—Technical Arrangements

FOR the television broadcast on Coronation Day, June 2, the BBC will use almost all its transportable camera equipment. According to present plans, a total of twenty-one cameras will be in use, divided between five main locations. These will be:

The Victoria Memorial, opposite Buckingham Palace.

A position just inside Hyde Park, near Hyde Park Corner.

A position on the Colonial Office site overlooking the west front of Westminster Abbey.

A position on the Embankment near Westminster Pier.

A number of positions in the Abbey itself.

The programme will be broadcast by the five high-power television transmitters now operating in Great Britain as well as by three low-power transmitters, one near Newcastle in North-East England, a second near Belfast in Northern Ireland and a third near Brighton on the South Coast.

Plans are also being worked out with France, Holland and Western Germany for the relaying of the programme in those countries. The vision signal will be taken in three centimetric-wave hops from London to Swingate near Dover and from there will be re-transmitted across the Channel to be picked up at a point near Cap Blanc Nez. From this point a fifth centimetric-wave link will convey it to Cassel in Northern France. The circuit between London and Cassel is to be provided by Messrs. Standard Telephones and Cables, Ltd., under contract to BBC and R.T.F.

From Cassel, the signal, still at the British 405-line standard, will be conveyed to Paris by R.T.F. and the French P.T.T. In Paris it will be used to feed the French 441-line transmitter and also, via a 405-line/819-line converter, to feed the Paris 819-line transmitter as well as the connected transmitter at Lille.

The French will also provide a direct link from Cassel to Lille for the 405-line signal and it is expected that the Dutch television authorities, in co-operation with I.N.R., will arrange for the signal to be relayed across Belgium to Lopik in Holland via relay points at Flobecq, Brussels, Antwerp and Breda. The conversion from the 405-line standard to the 625-line standard will probably be carried out at Breda. In Holland the signal will be broadcast by the Dutch transmitter at Lopik, as well as by the connected transmitter at Eindhoven. From Breda, the 625-line signal will be taken via four centimetric-wave links to Cologne where it will feed the N.W.D.R. television network supplying transmitters at Cologne, Langenburg, Hanover, Hamburg, Berlin and possibly Frankfurt.

The arrangements described above must at the moment be regarded as tentative and subject to review as a result of tests being carried out as we go to Press.

As regards accompanying sound, the following will be available in London for relaying to the Continent:

1. Sound effects free from any commentary.
2. The BBC commentary in English.
3. The R.T.F. commentary in French.

Those countries relaying the programme will thus have the opportunity of taking the sound effects and superimposing either their own locally-generated commentary, or the English or French commentary as desired.

# AUTOMATIC GAIN CONTROL

## A PRACTICAL A.V.C. ARRANGEMENT FOR TELEVISION RECEIVERS

By J. Alan Hutton, B.Sc.

ALTHOUGH it is true that many of us like adjusting our television receivers frequently, in order to obtain a slightly better picture, there is no doubt that many long-suffering families would very much appreciate automatic adjustment of the controls. This would prevent irritation due to constant attention and would, moreover, greatly simplify the task of producing tolerably good pictures.

Probably the most frequently-adjusted controls are those which control the gain of the receiver. Fringe viewers especially will be acutely aware of the differences in signal level according to the time of day. For example, daytime signals are usually weak, and, as dusk falls, the signal gradually increases in intensity. In addition to this, reception conditions vary according to the state of the weather ; fog, frost and snow each has an effect attributed to it, although all observers are not agreed as to which is good and which bad for reception.

Most television receivers have two vision gain controls—vision sensitivity and contrast. The former control is usually rather inaccessible, being adjusted, in theory, during the initial installation only, and any changes in gain which are required under running conditions are accomplished with the contrast control. These changes should be divided into two categories ; first, changes required for aesthetic reasons, or because of changes in room illumination, and secondly, changes required on account of signal level change. An automatic gain control circuit will enable us to remove one of the controls and will eliminate the adjustments required due to changes in signal amplitude. One control must still remain so that viewers can set the contrast to pleasing level, but, within certain limits, no further adjustments will be required.

The requirements, therefore, are that whatever happens to the input signal, the contrast of the picture will remain at a level selected by the viewer. In practice, circuits have limitations ; for example, very rapid changes in signal cannot be compensated by appropriate gain changes, and there is also an upper and lower limit to the gain of the receiver.

### Sound Circuits Not Suitable

We are all accustomed to automatic gain control in the case of sound reception, but the method adopted in this case is not suitable for television. The modulating voltage in sound transmission is fundamentally alternating in character, and the carrier amplitude varies about a mean level which is constant. Sound A.G.C. therefore works on the principle of maintaining a constant mean level of signal at the detector. In the case of our system of transmitting pictures, the mean carrier level depends upon the mean picture brightness which is by no means constant. It might be thought that the peak white level of a television signal is constant, but in the transmission of dark scenes it might be several minutes between signals which reach peak white level. The only component of the waveform which gives a constant level is the black level, which is 30 per cent. of peak white level. It is upon this black level that all automatic gain control circuits work when the signal is of the form transmitted in this country.

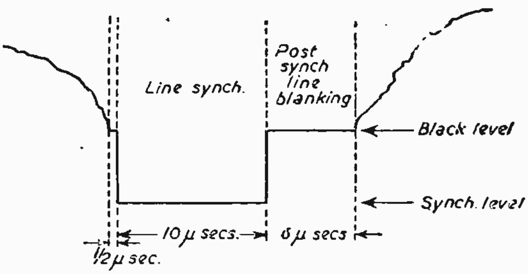



Fig. 1.—Line blanking waveform.

We must now examine the vision waveform and

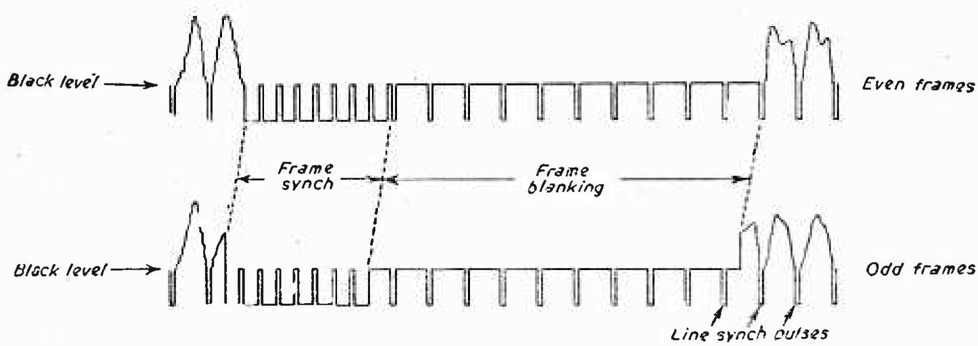



Fig. 2.—Frame blanking waveform.

determine where we can most effectively use the black level signal which is transmitted. (Figs. 1 and 2.)

We find a sample of the black level immediately before the line synchronising pulse (0.5 micro-seconds), immediately after the line sychronising pulse (6 micro-seconds except during the frame synchronising period) and during the frame blanking period (approximately 1 milli-second punctuated with line synchronising pulses). We can forget the 0.5 micro-second signal before the line synchronising pulse as it is too short to be of value, and are left with a choice of either 6 micro-seconds occuring 10,125 times per second, or 1 milli-second occuring 50 times per second (or perhaps both).

A.G.C. circuits may be divided into two classes according to whether they operate on line or frame

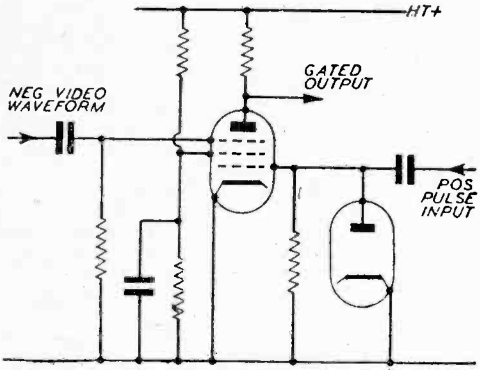


Fig. 3.—A gating circuit.

blanking, each having an advantage over the other which will be discussed later. On balance, it is fairly well agreed that frame A.G.C. is better and this has been confirmed by the writer as a result of experiments under fringe reception conditions.

**Function**

If we re-examine Fig. 2 we see that the only part of the waveform in which we are interested is the blanking period which follows the frame synchronising period, so we apply the waveform to an electrode (say the suppressor grid) of a valve which acts as a gate and opens only during the frame blanking period. This is accomplished by applying a pulse to another electrode, say the control grid, which makes the valve inoperative at all times other than during the period under consideration. A circuit which does this is illustrated in Fig. 3. The diode is a " D.C. restorer " the object of which is to maintain the most positive voltage of the pulse at earth potential. Fig. 4c shows the result of feeding a negative video waveform to the circuit.

If a small capacity is connected from the valve anode to earth, any rapid changes in voltage will be reduced and the result is the waveform of Fig. 4d.

We have therefore generated a pulse which varies in amplitude according to the vision signal amplitude. For very large signals, the voltage is almost H.T. line voltage, and as the signal is reduced the pulse voltage diminishes. The remainder of the circuit will attempt to maintain this pulse at a certain level. If the pulse diminishes in size the signal amplitude is too large and the receiver gain must be reduced. On the other hand, if the pulse amplitude increases the gain of the receiver must be increased.

The next stage in the circuit is to generate a constant voltage which depends upon the pulse amplitude. This is accomplished by means of a diode and a suitable time constant in the same manner as a peak voltmeter or detector.

One circuit for doing this is shown in Fig. 5. The voltage on the anode is maintained at the most negative voltage of the input pulse as far as the time constant R.C. will allow. The voltage on the output of this circuit is earth potential for very large signals when there is no pulse and gradually becomes more negative as the pulse amplitude increases, that is, when the vision signal is reduced.

This state of affairs is quite suitable for direct coupling to an unbiased D.C. amplifier. The anode voltage on this valve will fall when the vision signal is increased and is in a suitable condition for forming an A.G.C. line. An improvement is to use a cathode follower, as shown in the complete circuit Fig. 6. The gain of the D.C. amplifier is made high so that small changes in pulse amplitude, that is, small changes in video signal amplitude, cause large changes in the A.G.C. line voltage.

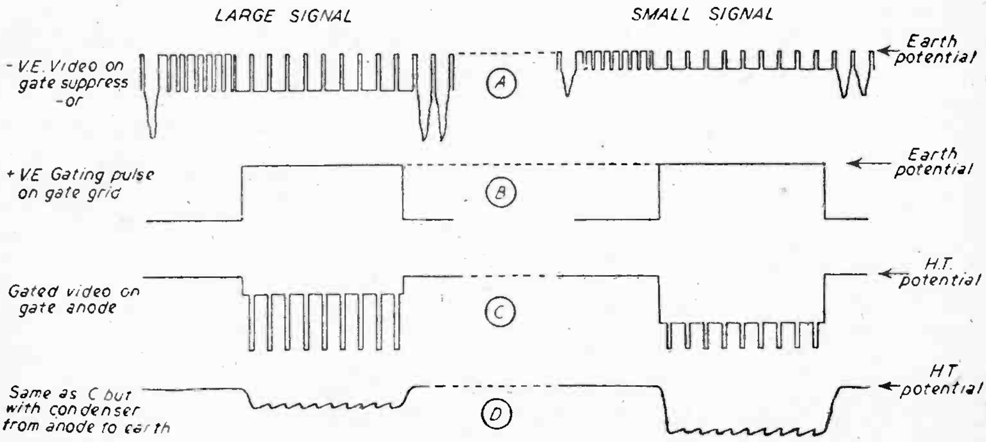


Fig. 4.—Waveforms at various parts of circuit shown in Fig. 3.

### Connections

The remaining problems about the circuit are how to connect the A.G.C. line to the receiver, how to obtain the gating pulse, and how to control the contrast.

A method of connecting the A.G.C. line to the receiver is shown in Fig. 7, all R.F. and all except the last I.F. amplifying stages can be controlled, the more the merrier. It is unwise to control the last I.F. stage because it is liable to overload if the screen voltage drops too low.

Each electrode that is connected to the A.G.C. line must be separately decoupled, each resistor and condenser being connected close to the appropriate valveholder.

Generating the gating pulse is quite simple. On the anode of the frame output valve will be found a "positive going" pulse of the type required. Unfortunately, it occurs a little early, during, in fact, the frame synchronising pulse, but it is a simple matter

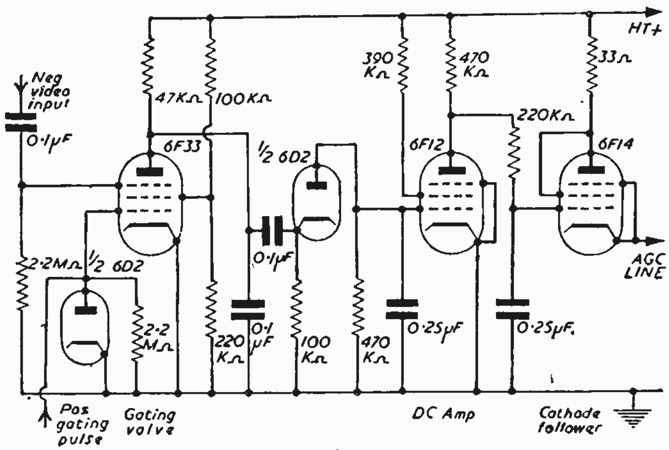



Fig. 6.—Cathode follower output.

to delay effectively the pulse by a phasing circuit, as shown in Fig. 8. The values depend somewhat on the frame output circuit and a little juggling may be required to produce the best result. It is clearly beneficial to have as long a pulse as possible, provided that it does not persist until the start of the picture information, since it gives the rectifying diode of Fig. 5 longer in which to charge the condenser on its anode, and tends to reduce the disturbing effect which interference pulses might produce. The condenser $C_2$ mainly controls the pulse length.

The method by which the contrast is controlled is not so easy. Any control which would previously have altered the gain of the R.F. or I.F. amplifiers will now be ineffective, for the A.G.C. line voltage will alter to correct the adjustment. One method is to have a variable gain amplifier after the point from which signal is taken to the A.G.C. unit, but a variable gain video amplifier of good and constant frequency response is not easy to design unless the voltage level is low. A better method is to place a variable gain amplifier between the video amplifier and the A.G.C. unit. The A.G.C. unit will always

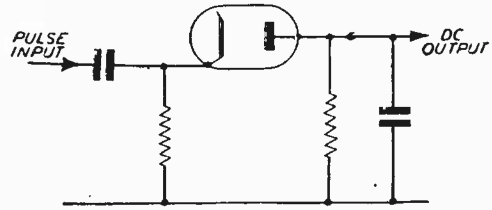



Fig. 5.—Circuit for obtaining a constant output.

set the level of vision signal at the gating valve to a certain value for the reasons outlined. In other words, it sets the vision signal level at the output of the proposed amplifier, Fig. 9. If the gain of this amplifier is changed by altering the amount of negative feed-back, the input voltage will have to change if the output remains constant. It is this input voltage which is connected to the cathode-ray tube grid, or, should the tube be cathode modulated, to the grid of the video output valve. The gain of the buffer amplifier, therefore, controls the contrast of the picture.

After this rather heavy-going explanation it might be interesting to point out the disadvantage of frame A.G.C. as opposed to line A.G.C. This lies in the fact that the frame A.G.C. circuit cannot respond to high frequency fades. In practice, this does not matter much because high frequency fading does not occur except in the case of beat frequencies due to reflections from aircraft and A.G.C. is not eminently suitable for curing this effect, for reasons explained in an earlier article on that subject. The maximum frequency at which frame A.G.C. can operate is a few cycles per second, the actual frequency depending upon the amplitude. If the gain of the receiver were to alter appreciably during the period between frame pulses, the contrast at the top of the picture would be different from that at the bottom, a very undesirable

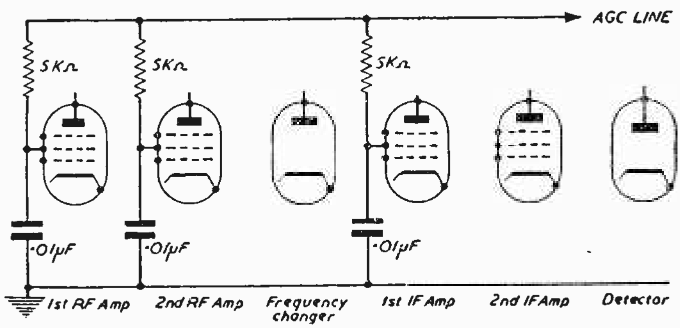



Fig. 7.—Block diagram of a normal receiver.

state of affairs, so the condenser at the anode of the diode in Fig. 5 must hold its charge fairly well for 1/50th of a second. This means that the circuit is sluggish and cannot respond to rapid changes in the voltage of the pulse which supplies charge to the condenser through the diode.

On the other hand, line A.G.C. receives a sample of the black level at a rate of roughly 10 Kc/sec. and can therefore accommodate all fading frequencies which can occur. It would therefore appear to offer advantages over frame A.G.C., but the only common source of high-frequency fading is, as has been stated, aircraft reflections, and it is the very nature of such a reflection that spoils the operation of the circuit.

When a signal is reflected from an aircraft the picture information arrives at the receiver after the same information has been delivered by the direct route, since it has travelled farther. This time delay is important from the line A.G.C. point of view, since it means that the reflected signal is not necessarily conveying a black level signal when the direction wave is and the gate is open. If, for example, the delay is 20 micro-seconds, the reflected signal is adding picture signal to the black level of the direct wave, and the A.G.C. voltage will depend upon the picture brightness of the portion of the reflected wave which is passed through the gate.

The circuit, Fig. 6, is only suitable for applying A.G.C. to the screens of the vision amplifier valves, and although the circuit works satisfactorily over a limited range there is a danger of oscillation when the A.G.C. voltage is high under weak signal conditions. It has been assumed that the gain of the receiver increases as the screen voltage is increased, and although this is usually the case, there may be a limit when the screen voltage is similar to, or greater than the anode voltage. Above this level, the gain may be reduced as the screen voltage increases and the circuit goes mad. Moreover a large change in screen voltage is required to change the amplifier gain and the A.G.C. is therefore only effective over a small range of signal variation—perhaps 20 db.

A much better way of controlling the receiver gain is to apply an A.G.C. voltage to the grids of the amplifying valves, but this is rather more complicated and requires a negative supply. Alterations to the

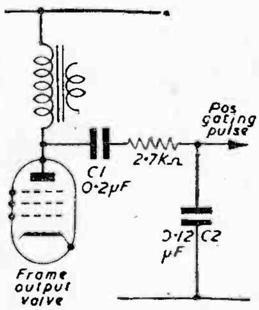



Fig. 8.—Phasing circuit for delaying the gating pulse.

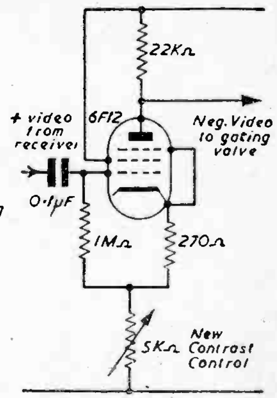



Fig. 9.—Variable gain amplifier for inclusion between video stage and A.G.C. unit.

tuned circuits are necessary, and there is danger of upsetting the receiver response.

The circuit for a unit which is suitable for applying an A.G.C. voltage to the grids is very similar to that outlined above, but a delay voltage will be required. In the circuits described a delay is provided by the nature of the screen characteristics of R.F. pentodes

# Temporary Transmitters

THE BBC recently started transmissions from the temporary low-power television station at Glencairn, near Belfast, and from that at Pontop Pike, near Newcastle.

As announced by the Assistant Postmaster General, these stations have been installed as a temporary measure pending the approval of the Government to the permanent medium-power stations that the BBC plans to build. To enable the temporary transmitter at Glencairn to be brought into service at the earliest possible moment, the Post Office established a temporary television link connecting Glencairn to the main television network. Meanwhile, in view of the temporary nature of the link, some fading, interference and even complete loss of picture, must be expected at times, particularly when there are sudden changes in weather conditions.

This problem does not arise in the case of Pontop Pike, because the permanent television links carrying the programme to Scotland were planned so as to pass close to the site of the new station. As the latter initially uses a temporary transmitting aerial, the coverage is generally somewhat less, and in certain directions appreciably less, than that to be provided when the permanent aerial is installed, which it is hoped will be before the Coronation.

**Technical Details**

As previously announced, the technical details of the transmissions are as follows:

**Glencairn**

| | |
|---|---|
| *Frequency* ... | Vision 45.0 Mc/s, Sound 41.5 Mc/s } Channel 1 |
| *Polarisation* ... | Horizontal. |
| *Transmission* ... | Asymmetric sideband system. |
| *Estimated Coverage* | City of Belfast and its immediate surroundings. |

**Pontop Pike**

| | |
|---|---|
| *Frequency* ... | Vision 66.75 Mc/s, Sound 63.25 Mc/s } Channel 5. |
| *Polarisation* ... | Horizontal. |
| *Transmission* ... | Asymmetric sideband system. |
| *Estimated Coverage* (with permanent transmitting aerial) | Within a radius of approximately twenty miles of Pontop Pike. Pontop Pike is approximately nine miles south-west of Newcastle-on-Tyne. |

In each case the frequencies of the vision and sound carriers are slightly offset from those of the high-power transmitters using the same channel (Alexandra Palace and Wenvoe respectively), so as to reduce the effects of interference from them in the fringe areas.

# Constructing a Three-element Aerial

## CONSTRUCTIONAL DETAILS OF A ROBUST AND HIGH GAIN ARRAY

By Gordon A. Symonds

WHEN constructing one's own television aerial it is necessary, as far as possible, to ensure that strength and durability are all that can be desired. A glance skyward will often show the pruning effect high winds have had on elements of small diameter and thin gauge. There is also the question of protection from the effects of the weather. Most enthusiasts, even if they purchase a commercial aerial, will take the precaution of giving the whole assembly a coat of paint before leaving it to fend for itself.

As anyone who has erected an aerial will know, they are large cumbersome objects. The elements of a Channel 1 aerial have a length in excess of 10ft., and because of this manufacturers have to make these in two pieces. On assembly they are usually joined by sliding each half into a socket on the cross-arm, and retained by means of one or two screws. Now, in order that the elements may operate correctly, they must have a continuous *electrical* length, a condition which may obtain when first assembled but which becomes rather doubtful after a few months' exposure to wind and rain. On inspection a white powdery deposit, which is quite a good isulator, will usually be found between the end of the element and its socket. It is obviously useless to paint between these surfaces since they must be maintained in electrical contact with each other.

The feeder connection is often another electrically weak point, most aerials employing a system of solder tags and screws. The author has seen one type in which the uppermost socket of the insulator became completely filled with water draining from the outside of the upper dipole element.

It is felt that little can be done to improve on the gain of an array of a given number of elements, a high standard of performance having already been achieved in this direction by all leading manufacturers. Attention to the above shortcomings, however, would assist greatly in maintaining this performance for a much longer period.

### Three Element Array

In designing the aerial to be described, a three element array was decided upon as one of high gain was required. Although a four element aerial would give a slightly stronger signal, it has the disadvantage of being much more unsightly.

A glance at Fig. 1 will show that matching the aerial to the feeder is achieved by the use of a folded dipole. This method obviates the difficulty of attaching an insulator to the cross-arm, besides giving broad-band characteristics. All dimensions are given in Table 1, with the exception of the fold spacing. This is the same for all channels as it depends on the tubing diameters.

### Material

Material for the elements is ⅝in. diameter by 16 S.W.G. duralumin tubing which should be obtained in continuousl engths so as to overcome the difficulty of maintaining electrical continuity at the sockets.

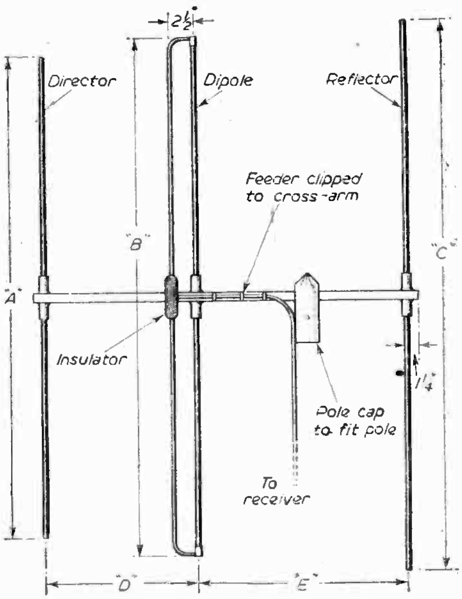
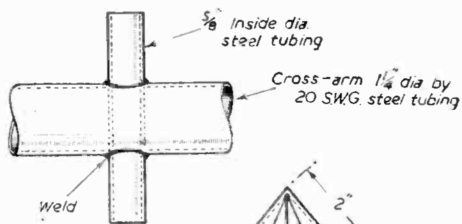



Fig. 1.—Layout of aerial.



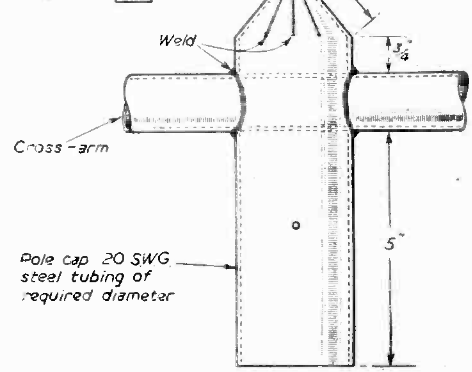




Fig. 2 (above).—Socket details.
Fig. 3 (below).—Details of pole cap.

The cross-arm is of 1¼in. diameter by 20 S.W.G. steel tubing and for the folded portion of the dipole 5/16in. diameter by 20 S.W.G. is employed in order that the feeder connections may be soldered direct to the tubing, thus removing any risk of doubtful connections at this point. The smaller diameter tubing gives the correct impedance step-up to match the cable.

The cross-arm is made up by welding 4in. lengths of ⅜in. inside diameter steel tubing into holes cut at the correct positions (see Fig. 2). The holes can easily be

TABLE I.—All Dimensions are in Inches.

| Channel | Dimension in Fig. 1. | | | | |
|---|---|---|---|---|---|
| | "A" | "B" | "C" | "D" | "E" |
| 1 | 115.75 | 121 | 130.5 | 26.5 | 38.5 |
| 2 | 104.5 | 109 | 117.5 | 24 | 34.75 |
| 3 | 94.75 | 99 | 106.75 | 22 | 31.5 |
| 4 | 87 | 91 | 98 | 20 | 29 |
| 5 | 80.5 | 84 | 91 | 18.5 | 26.75 |

made by scribing a circle on each side of the tubing, drilling a series of small holes around the inside of the circle and filing out to size. After filing one hole a piece of tubing should be inserted, and this used to check that the other holes are being filed correctly in line. Cleaning out the sockets after welding to enable the elements to slide through freely may be done with a file, or better still, if one is available, a ⅝in. diameter reamer.

The pole cap, made from a 9in. length of 20 S.W.G. steel tubing of sufficient diameter to accommodate the pole the constructor intends to use, can be made as indicated in Fig. 3. It should be positioned midway between the dipole and reflector. The pointed end is formed by cutting the tubing so that eight spikes are made each about 2in. long ; these are then bent over so as to meet each other and welded together. Alternatively, the tubing can be cut square at the end and a flat circular plate welded on top in order to keep out the rain. Four holes to take a number 8 wood-screw

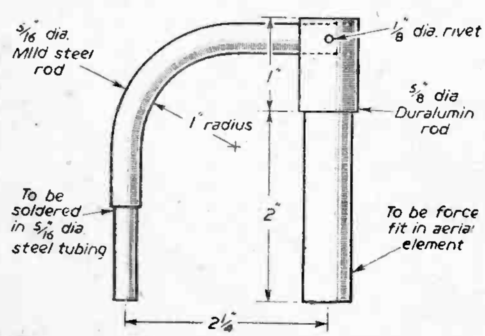



Fig. 4.—Details of the folded dipole attachments.

are needed in the skirt of the pole cap to enable the whole assembly to be fixed rigidly to the mast.

The local garage will usually undertake small welding jobs of this nature for a reasonable sum.

Fig. 4 shows how the two portions of the folded dipole are joined together. To make these parts the constructor must have access to a lathe. The ⅝in. diameter dural rod is reduced in diameter to fit tightly in the dipole tubing which should be lightly cleaned out with emery cloth. It is not necessary that the reduced 5/16in. diameter steel rod should be such a good fit in its tubing, since it is required that solder should be allowed to run between the two surfaces when assembling the aerial. After bending to the required shape the rod can be forced into the hole drilled close to the end of the dural piece and the two riveted together.

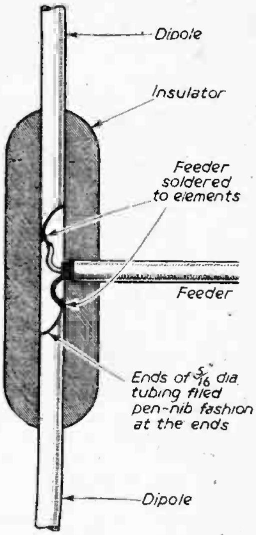
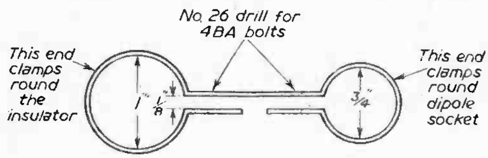



Fig. 5.—Method of connecting feeder to folded dipole.




Two of these clips are needed, made from ½" wide by 16 S.W.G. steel strip

Fig. 6.—Folded dipole clip.

## The Insulator

The elements can be secured in their respective sockets by means of self-tapping screws, taking care to see that there is an equal length of tubing both above and below the cross-arm. Next the folded dipole attachments can be driven into the ends of the aerial element, with the thinner portion standing out at right-angles to the cross-arm. The 5/16in. diameter tubing should then have the inside ends cut to the shape shown in Fig. 5 to facilitate soldering, and should be of such a length that a ¼in. gap is left in the centre. These can then be soldered in position.

The insulator, a sectional view of which is seen at Fig. 5, is made by drilling a 5/16in. diameter hole axially through a 4in. length of 1in. diameter ebonite or similar material. It is then sawn through lengthwise and a hole of the same diameter as the feeder to be used is drilled in one piece. The cable can then be passed through the hole, the connections soldered to the folded dipole and the two halves of the insulator brought together after liberally smearing the contacting surfaces with a waterproof sealing compound to keep out the weather.

The two clips (see Fig. 6) are then required and should be placed at about 1in. from each end of the insulator.

The ends of the director and reflector should be plugged with short pieces of rod or wooden dowelling, and the whole array given two or three coats of good quality aluminium paint. Do not, however, paint the insulator.

# Pages from a TELEVISION ENGINEERS Notebook

## 6.—MULTIVIBRATOR SAWTOOTH GENERATORS

THE multivibrator is a useful circuit system for use as a television sawtooth generator as it avoids the use of a transformer such as is used in blocking oscillators and, unlike the Miller-transitron, produces a positive-going output. In addition it is easily synchronised to a train of incoming pulses of either positive or negative polarity.

Basically, the system is as shown in Fig. 1(a), being a two-stage resistance-coupled circuit with the output of the second valve fed back to the input of the first. Suppose the circuit is balanced, both valves conducting, and that a small negative pulse is applied to the grid of $V_1$. This stage is biased back and the anode potential consequently rises. This rise is transferred to the grid of $V_2$ through $C_1$ and increases the anode current of this stage. A drop in the anode potential follows, and this is transferred to the grid of $V_1$ through $C_2$, augmenting the negative condition already existing there. The effect is cumulative, and $V_1$ is rapidly cut-off, while $V_2$ is driven into saturation. This state continues until the charge on $C_2$ has leaked away through $R_3$ sufficiently for $V_1$ to conduct, however slightly. The cycle of switching then repeats in the reverse direction, $V_1$ finally being saturated with $V_2$ completely cut-off. For $C_1=C_2$ and $R_3=R_4$, the output waveform is symmetrical as the figure shows.

This particular form of the circuit is known as the anode-coupled multivibrator, but an alternative form known as the cathode-coupled multivibrator is given in Fig. 1(b). In this circuit the coupling for the necessary feedback from $V_2$ to $V_1$ is obtained by means of the common cathode resistance $R_k$. $V_1$ is coupled to $V_2$ through the usual $C_1R_4$ combination, and so $V_2$ can be cut off by heavy current in $V_1$ as $C_1$ discharges through $R_4$ because of the drop in $V_1$'s anode voltage. $V_1$ is cut off by the cathode bias developed across $R_k$ when $V_2$ conducts, since the anode current for both stages flows through $R_k$. The circuit therefore functions as a free-running oscillator with each valve conducting alternately, and the waveforms produced are consequently similar to those shown in Fig. 1(a).

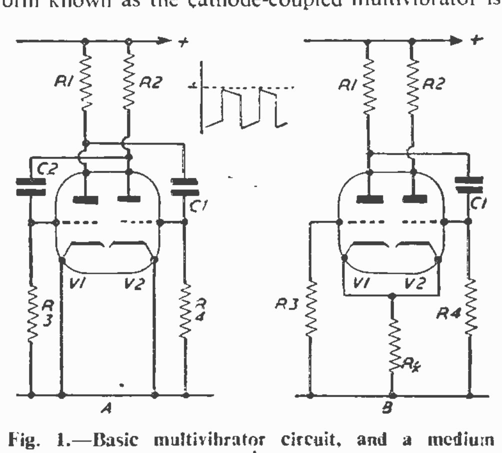



Fig. 1.—Basic multivibrator circuit, and a medium version.

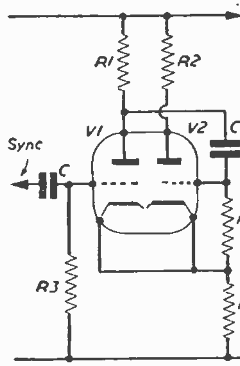



Fig. 2.—This type of multivibrator is not "self-running," operating only in the presence of a sync pulse input.

### Single-cycle Circuit

A form of multivibrator which is sometimes very useful is shown in Fig. 2. This form of circuit operates only in the presence of synchronising pulses applied through C to the grid of $V_1$, when one single cycle of switching is performed. The circuit is very similar to that of Fig. 1(b) as a glance will reveal, with the exception that the grid resistance $R_4$ of $V_2$ is returned to the cathode common line instead of to earth. The voltage drop across $R_k$ is consequently applied as bias to $V_1$ only, $V_2$ operating at zero bias. When the circuit is at "rest," $V_1$ is cut off by the bias developed across $R_k$ by the steady anode current of $V_2$. The application of a positive sync pulse at the grid of $V_1$ causes this valve to conduct, and a voltage drop occurs across $R_1$. This drop is applied as a negative pulse to the grid of $V_2$ via $C_1R_4$, which reduces the anode current and hence the bias voltage across $R_k$. In this way, the unbalance started off by the sync pulse cuts $V_2$ off almost instantly, and simultaneously $V_1$ becomes fully conducting. When the charge on $C_1$ has leaked away sufficiently for $V_2$ to conduct again, the switching cycle ends and the original condition returns, remaining until the arrival of the following sync pulse.

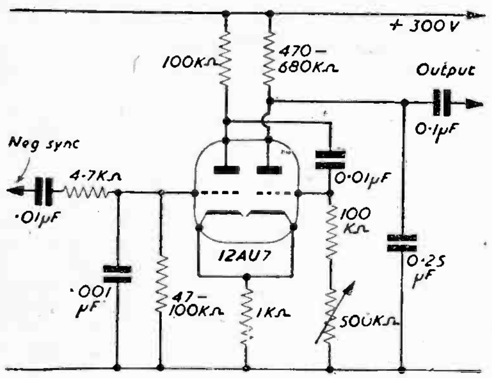



**Fig. 3.—An experimental frame oscillator stage.**

### Practical Circuitry

An experimental circuit for use at frame frequency is given in Fig. 3. The charging condenser is the 0.23μF wired across the anode-earth points of the second valve, the time-constants of the couplings being such that this valve is cut off for the time of the frame sweep, and conducting heavily for the period of the flyback, i.e., an unsymmetrical multivibrator.

The frequency (or Hold) control consists of the 500K Ω potentiometer in the grid circuit of $V_2$ and this is set so that the oscillator is correctly locked by the incoming sync signals. Increasing this resistance reduces the natural frequency of operation, and vice versa. Possible component variations are indicated.

### Synchronisation

The multivibrator can be synchronised by either polarity of pulse, although the negative pulse is more easily obtained from the usual separator pentode fed with a negative-going video signal. Fig. 4 shows the action of negative sync pulses on the circuit just described. After a few cycles, the multivibrator is pulled into synchronism, although the sync pulse amplitude is not sufficient by itself to bias $V_1$ directly to cut-off. It is sufficient that it reduces the anode current of $V_1$ enough to produce a resultant positive excursion at the grid of $V_2$, to drive this stage into conduction. Note that a negative sync pulse is applied to a valve that is normally conducting, i.e. $V_1$. If a positive pulse is used it must be applied to the valve ($V_2$) that is non-conducting, and must have sufficient amplitude to lift the stage above cut-off. If the sync signal weakens, therefore, this method of feed is likely to lose hold, and the negative sync input is therefore to be preferred.

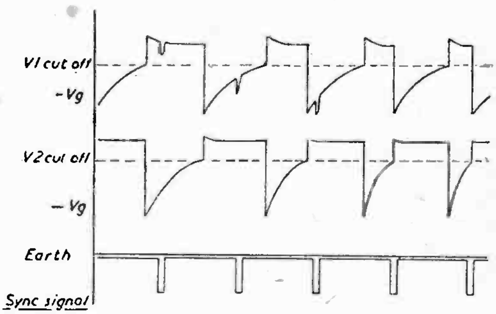



**Fig. 4.—Waveforms in an oscillator stage of the type shown in Fig. 3.**

# The Top Band

DURING the currency of the Cairo Radio Regulations, the band 1,715-2,000 kc/s has been available (shared with other Services), for use by radio amateurs throughout the world. United Kingdom amateurs have been permitted to use the band subject to a power limitation of 10 watts.

The Post Office has given very careful consideration to the question as to how far it will be practicable for U.K. amateurs to continue to use the band without causing harmful interference to the authorised Services of other countries.

The Post Office has, therefore, decided to assign to U.K. amateurs a band 200 kc/s wide in this part of the spectrum subject to strict non-interference with other Services (United Kingdom and foreign), and to prohibit the further use of frequencies between 1,715 kc/s and 1,800 kc/s. The Post Office asks that U.K. amateurs should use the band sparingly during the next few weeks.

Following a meeting between representatives of the Post Office and the R.S.G.B. it was announced that the 200 kc/s band is to fall between 1,800 kc/s and 2,000 kc/s. We are asked to stress the importance of licensed power not being exceeded under any circumstances.

| Frequencies | Assignments |
|---|---|
| kc/s | |
| 1,827 | Wick and Folkestone. |
| 1,834 | Niton. |
| 1,841 | Cullercoats and Land's End. |
| 1,848 | North Foreland and Oban. |
| 1,855 | Burnham, Stonehaven and Newhaven. |
| 1,869 | Humber. |
| 1,883 | Portpatrick. |
| 1,911 | Land's End, Niton and Seaforth. |
| 1,925 | Land's End, Niton and Seaforth. |
| 1,953 | British Ships. |
| 1,960 | French Ships. |
| 1,974 | Dutch Ships. |
| 1,981 | British Ships. |
| 1,988 | Danish Ships. |
| 1,995 | Dutch Ships. |

In the interests of all concerned U.K. amateurs would do well to avoid the vulnerable frequencies which are in use by the Marine Services in their own particular locality.

# Conversion To Magnetic C.R.T.

## DETAILS OF TWO EASILY BUILT UNITS BASED ON ELECTROSTATIC TIMEBASES

(*Continued from page 545, May issue.*)

THE transformer requires an area of approximately 0.5 sq. in. for the centre limb and a window area ⅝ in. by 1¼ in. (see Fig. 5). One of the older type of loudspeaker transformers can be used, though there are plenty of ex-Govt. high cycle transformers which are suitable. The main thing is to ensure the centre limb is about the size shown, and for good regulation the window should not be too large as the windings should just about fill it.

The transformer should be taken to pieces and the lay of the stampings noted. The existing winding should be taken off and rewinding can then commence.

Where some doubt exists as to the suitability of a transformer, the number of turns required can be easily calculated from the approximate formula :

$$N=\frac{5.6}{A}$$

where N = the number of turns required
A = cross-sectional area of centre limb.

The prototype used a Mazda C.R.T. with a 2-volt heater. The T2 transformer primary was wound with 65 turns of 22 S.W.G. enamelled wire. The wire was simply laid on the core former about ⅛in. in from the end and close wound. The complete number of turns could not be accommodated with a single set of turns and a second layer was made after the first had been covered with a single layer of oiled silk.

The secondary was wound with the same gauge wire, enamelled and close wound. As a 2-volt heater was being used, a total of 27 turns was wound on. (Note the calculated figure gave 23 turns but under test the losses reduced the available voltage under load and the extra turns were added.)

The secondary was wound in a single layer after the primary had been covered with a double layer of oiled silk.

Where a 4v. C.R.T. heater is required the number of turns should be 45.

After the secondary had been wound the whole core was covered with two layers of oiled silk which were kept in place with a length of cotton thread. The stampings were reassembled with ends touching so that there was no open gap between them. The final operation was to bolt the stampings together and to mount a termination strip on the top for ease of connection.

A transformer such as this is very easy to construct and the one in the prototype has given very satisfactory service.

### Construction of T2

This transformer requires some care in winding. The method used with the prototype was as follows :

A transformer whose core met with the same specifications as that of T3 was stripped down in a similar manner. The primary was then wound on, using 20 S.W.G. enamelled wire in two layers, 65 turns being required. This formed the primary and it was covered by two layers of oiled silk. The oiled silk was then covered with one complete turn of copper foil which was earthed. It is important that the copper foil

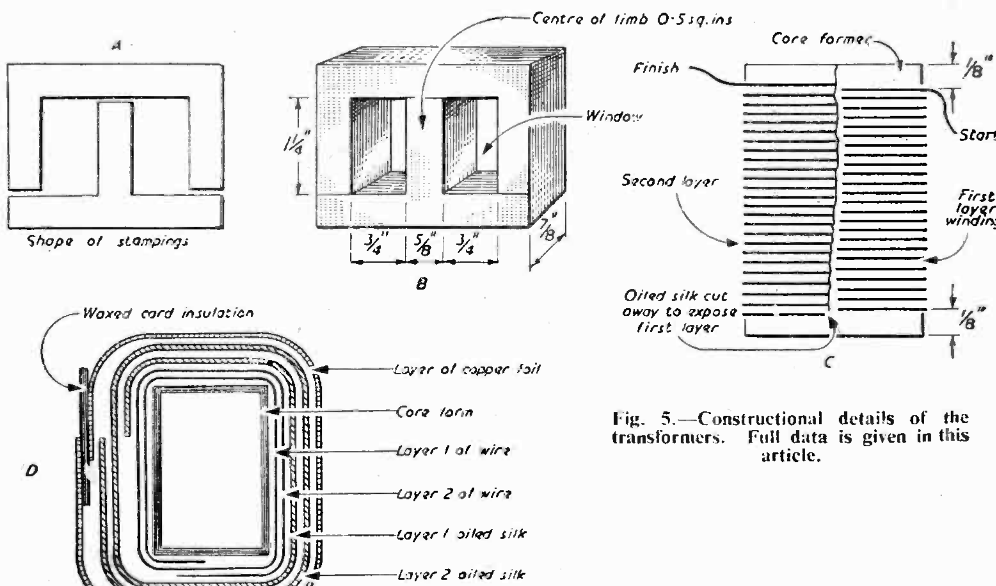



Fig. 5.—Constructional details of the transformers. Full data is given in this article.

overlaps by approximately ¼in., but the ends at the overlap are insulated from each other (see Fig. 5(D)). Under no circumstances must the copper foil form a complete electrical circuit.

On top of the foil was wound five layers of oiled silk and on top of this secondary (1) was wound. By using a two-volt rectifier valve the number of turns was restricted to 23 of 22 S.W.G. enamelled wire.

Another five layers of oiled silk was wound on top of secondary (1) and then secondary (2), which was a duplicate of secondary (1), was wound on.

Each layer was started about ⅛in. below the top of the previous layer.

The copper foil screen was added as a safety precaution so that in the event of a breakdown of insulation the E.H.T. would be earthed directly ; it could probably have been left out.

If the transformer is made it is important to ensure that secondary (1) is used for V2 and secondary (2) is used for V3.

It is not necessary to use only 2v. rectifier valves though it will be found that with the window area specified it will be difficult to wind two 4v. secondaries.

Under test conditions the prototype transformer became a little warm after four hours' continuous running but it did not become hot.

### Alternative E.H.T.

It is possible to use the existing E.H.T. transformer from the VCR97 circuit. The output of the transformer should be connected across a doubler network as shown in Fig. 6.

It is possible to use the existing rectifier heater winding on the transformer for V2 but V3 should have its separate supply either by using a transformer constructed as T2 with secondary (1) omitted, or by a separate heater transformer insulated for 2.5 Kv. If the heater winding for the VCR97 heater on the existing E.H.T. transformer is insulated for a 2.5 Kv. then this winding can be used for V3.

In either case the transformer core must not come into contact with the chassis but should be well insulated from it.

This method of deriving E.H.T. is quite useful but is not completely reliable, as the 2.5 Kv. transformer is rather liable to breakdown.

Reverting to the original scheme using T2 and T3 it will not be found necessary to insulate either of these transformers from the chassis.

Note that the network C4, 5, 6 and R9, 10 should be mounted on a paxolin sheet and kept at least ½in. clear of the chassis.

It will be found that the E.H.T. voltage is sufficient to operate a 12in. tube in normal room lighting provided the light does not fall directly on the face of the tube.

The constructor may like to overwind the heater winding of T3, which supplies the heater voltage for the C.R.T., in the manner suggested in the recent article by Mr. E. N. Bradley on "Picture Tube Rejuvenation," published in the December, 1952, issue of PRACTICAL TELEVISION. By this means he can provide for future deterioration of the tube and thus prolong its life.

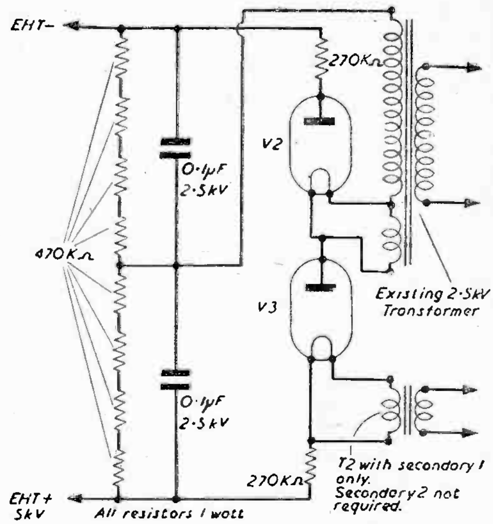



Fig. 6.—Details of the E.H.T. supply and doubler network.

The experimenter may wish to try the effect of metal rectifiers in lieu of the E.H.T. valves ; the results obtained by this method do not appear as satisfactory as the valves.

### Constructional Details

There should be no difficulty with the actual construction as no special requirements have to be met beyond those used in normal TV practice. It is advisable to keep the two circuits (frame amplifier and line amplifier) clear from each other so as to avoid any interaction.

The prototype was constructed on an ex-radar chassis, but the constructor may like to make a new chassis himself. Details of the construction and layout of components are given in Fig. 7. Although a front panel was used as a mounting for the controls it is not strictly necessary ; all the controls are pre-set and can be mounted on the chassis direct.

As a matter of convenience the inputs from the existing timebase were made via the well-known Pye plugs and sockets.

(*To be continued*)

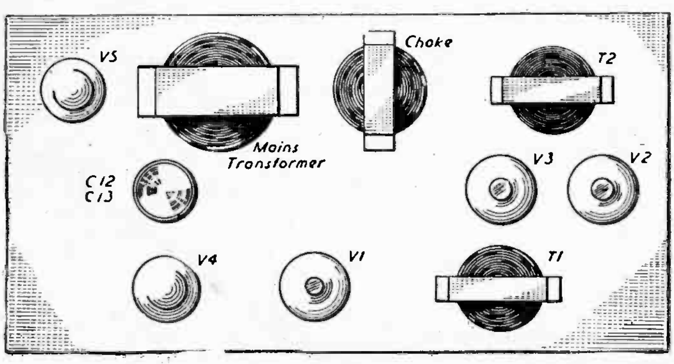



Fig. 7.—Suggested layout.

# A BEGINNER'S RECEIVER–4

## AN EASILY-BUILT SUPERHET CIRCUIT, UTILISING AN EX-GOVERNMENT UNIT–R3170A

By B. L. Morley

(*Continued from page* 554 *May* 1953 *issue*)

CONTINUING the modification of the vision receiver.

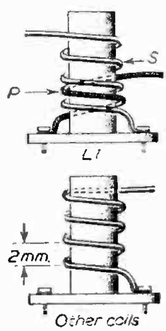
4. Wire 50 μF condenser (existing) to last tag on switch.
5. Wire in the 0.01 μF condenser.
6. Wire in the 0.25 μF condenser by mounting earthed through a hole in the mounting support of the 50 μF condenser and taking the wire through to the earth tag on the adjacent tag strip. A stiff piece of wire is wired from the top of the condenser to tag 3 on the switch.
7. Single tag strip under chassis to which a 100K Ω ½ w. condenser is wired adjacent to the EA50. Run a wire from this strip to the anode of the diode.
8. Disconnect the strap between the big 10K Ω resistor on the back panel and the fresh 0.1 μF condenser below it. This condenser has been put in so that a spot suppressor circuit can be fitted, if desired, for a cathode-modulated C.R.T. of the magnetic type.
9. Run a coaxial cable from the junction of the 10K Ω resistor and L15, to the output socket on the front panel.
10. For grid modulation, such as is common with the VCR97, change the cathode resistor of V9 to 68 Ω. For cathode modulation the cathode resistor should be 180 Ω. In this case the anode and cathode of the detector should be reversed and the output from the video stage modified in accordance with Fig. 19b. This completes the vision section. A wiring diagram of the modifications is given in Fig. 19a, with additions for cathode modulation in Fig. 19b.

### The Sound Receiver

For the advanced worker: Wiring of the sound section can proceed in accordance with Fig. 8. It is a good idea at this stage to fit the mains transformer. Care must be taken in soldering the crystal diode in position and a pair of pliers should grip the wire between the diode and the soldering tag to divert the heat.

For the novice: although the sound section may appear complicated to the beginner, it is quite easy to wire if the step-by-step wiring instructions are followed.

1. Wire earthed heater tag of V12 to nearest earth tag; wire pin 1 V13 to V12 heater tag. Wire pin 9 of V13 and unearthed heater tag of V12 to heater common. Wire heaters of V14.
2. Wire L16 bottom end of secondary to 500 pF and the other side of condenser going to earth and top end of coil to grid of V10 and wire the 1M Ω resistor between this grid and earth.
3. Run a coaxial lead from primary of L16 to the coupling coil on L7a. This coupling coil is wound on the bottom of the two coils as follows: solder one end of 22 s.w.g. plastic covered wire to earth tag on V6 side of the coil mounting and wind one and a half turns clockwise, anchoring the end to a spare tag on the baseboard tag strip close by. This point is the mixer end of the coaxial connection. The primary of L16 is wound in a




COIL DATA

| | L1 P | L1 S | L2 | L3 | L4 | L5 | L6 | L16 | 17 | 18 |
|---|---|---|---|---|---|---|---|---|---|---|
| Alexandra Palace | 2 | 7 | 7 | | 7 | | 7 | 8 | 8 | 10 |
| Holme Moss ... | 2 | 6½ | 6½ | | 6½ | | 6½ | 8 | 8 | 10 |
| Kirk o'Shotts... | 2 | 6 | 6 | See Text | 6 | See Text | 6 | 8 | 8 | 10 |
| Sutton Coldfield | 1½ | 5½ | 5½ | | 5½ | | 5½ | 8 | 8 | 10 |
| Wenvoe ... | 1½ | 5 | 5 | | 5 | | 5 | 8 | 8 | 10 |

L1S, 2, 4, 6. Wound with 22 s.w.g. wire, 2 mm. spacing, clockwise windings (2 mm. equals approximate thickness of the wire).
L1P. Wound with 22 s.w.g. insulated wire, clockwise.
L3, L5. Wound as per text.
L16, 17, 18. Wound clockwise, 34 s.w.g. enamelled silk and cotton covered, close wound. All formers ⅜in. All coils have iron cores. All vision I.F. coils are *in situ*. L2 and L4 formers are *in situ*.

COIL WINDING DATA
(For Pre-amplifier Circuit, Fig. 3 in March issue.)

| | Alexandra Palace | Holme Moss | Kirk o' Shotts | Sutton Coldfield | Wenvoe |
|---|---|---|---|---|---|
| Lp1 tap | 3 | 2½ | 2 | 2 | 1½ |
| Lp1 | 12½ | 11 | 9½ | 8 | 6 |
| Lp2 (P) ... | 12½ | 11 | 9½ | 8 | 6 |
| Lp2 (S) ... | 3 | 2½ | 2 | 2 | 1½ |

¼in. coil formers with iron-dust cores, wire 22 s.w.g. Bare 2 mm. spacing between turns (closer spacing will be required on Holme Moss and Alexandra Palace to accommodate turns).
Lp2 (S) insulated wire.

similar manner, the top end of the coil being anchored by using a spare position on the nearest heater choke. This will enable connection to the coaxial to be made. The braided covering of the coaxial is earthed at both ends.

4. Wire 180Ω in cathode of V10 and decouple with 1,000 pF.

5. Wire from uncondensered side of the 1KΩ resistor on the adjacent tag strip to H.T. plus.

6. Wire in second sound I.F. coil bottom end to earth and top end to grid of V11. Earth suppressor grid of V11.

7. Fit 5.6KΩ between condenser end of 1KΩ resistor (just mentioned) and anode of V10.

8. Fit 500 pF between screened

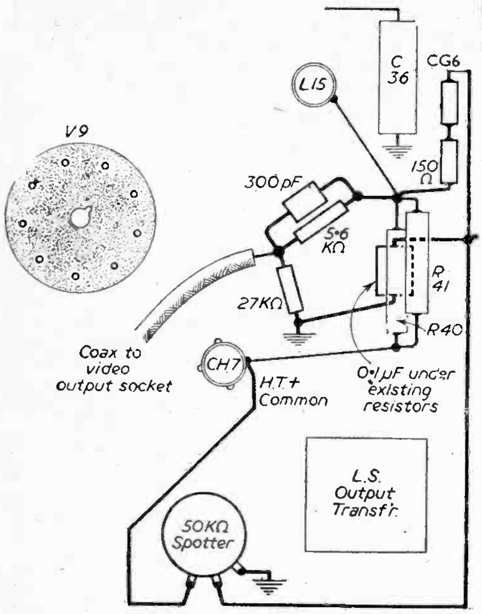



**Fig. 19 (b).—Additional components and modifications for cathode modulation.**

grid of V11 and earth and connect a 1KΩ to H.T. common where the condenser is connected to the screened grid.

9. Fit 180Ω resistance and 500 pF condenser in cathode of V11 (remove 1,000 pF condenser from chassis earth tag to allow new condenser and resistance to be fitted).

10. Fit three-point tag strip using spare hole adjacent to coil L18 and fit earth tag to retaining bolt.

11. Wire cathode of diode to end tag; wire top of L18 to centre tag; wire 1KΩ from end tag of this tag strip to screened grid of V11 and solder the free end of adjacent spare 1,000 pF condenser to this valve tag. Wire

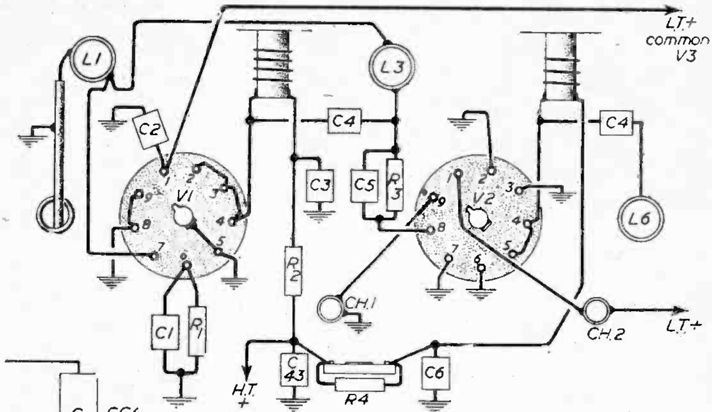



**Fig. 18.—Wiring diagram of R.F. stages.**

8.2KΩ from anode V11 to the end tag and wire 500 pF between end tag and earth. Wire 1.8KΩ from end tag to H.T. common.

12. Wire 1KΩ in cathode of V13 and wire in 25 μF from cathode to earth. This condenser lies flat on the chassis, the negative end being fastened under the retaining bolt of the rectifier valveholder.

*(To be continued)*

## ERRATA

(i) Page 513, April issue, Fig. 7. The centre lead of the coaxial output cable should be connected to the junction of the 5.6K and 27K resistors and not to earth.

(ii) Page 553, May issue, penultimate paragraph of Section I. For L18, 19 and 20 read L16, 17, 18.

(iii) Page 554, May issue, paragraph 9. For L10 read L6.

The author regrets any inconvenience caused by these items, though it will be observed that a check between text and diagrams would have made the position clear in each case.

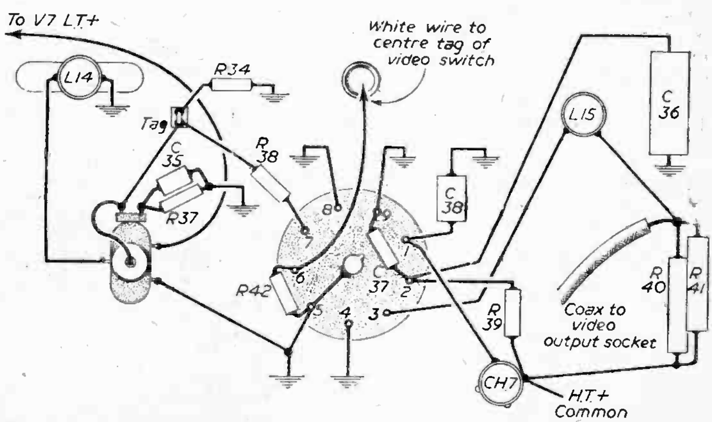



**Fig. 19 (a).—Video stage for grid modulation.**

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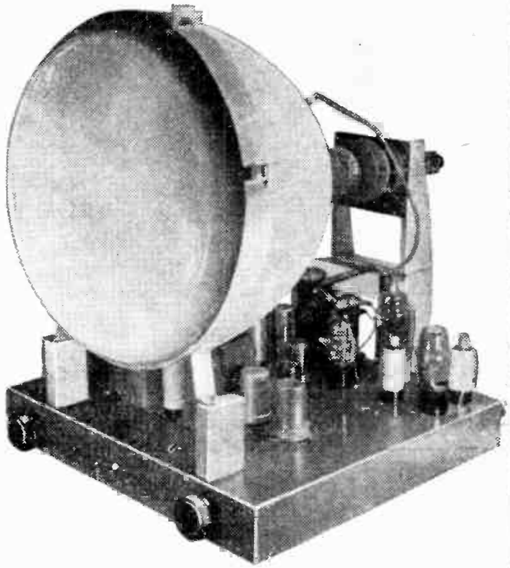

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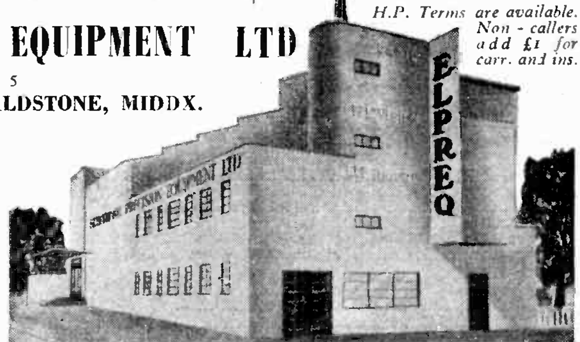


# Television Picture Sizes and Shapes

## A VEXED QUESTION

By H. J. Barton-Chapple, Wh.Sch., B.Sc., etc.

QUITE apart from cabinet appearance, technical data and the observed quality of the picture, there is no doubt that the potential purchaser of a television set must be confused by the variety of picture sizes and shapes which are obtained from the same sized direct-viewing cathode-ray tube. There are, no doubt, a number of reasons for this inconsistency and, perhaps, one of the most important contributory factors is the general absence of a really flat face to the cathode-ray tube. If a would-be viewer studies the literature available before deciding on a set, he finds that some makers content themselves with giving only an overall picture area in square inches. Others appear to use a measuring tape which follows the convex face of the tube, while the remainder just give the width and height of the cut-out in the tube mask. There are pictures with rounded corners of differing radii and pictures with almost square corners together with those having curved sides and straight top and bottom edges. The inconsistency does not stop there, however, for if any reference is made to the published breadth and height of the picture, it will be found that many do not even conform to the present 4 : 3 standard ratio which has been used by the BBC for over two years. The previous ratio employed was 5 : 4.

To substantiate these remarks, nineteen sets made by fifteen manufacturers were selected at random as representing a fair cross-section of the sets now on the market. These sets which must, of course, remain anonymous were all featured at the Radio Exhibition held at Earls Court in September, 1952 :

| Cathode-ray Tube Diameter | Listed Picture Size | Picture Ratio |
|---|---|---|
| 12in. | 10⅝in. x 8in. | 1.328 |
| 12in. | 10in. x 8in. | 1.250 |
| 12in. | 10½in. x 7⅞in. | 1.333 |
| 12in. | 10⅝in. x 8in. | 1.328 |
| 12in. | 10in. x 8in. | 1.250 |
| 12in. | 11in. x 8¼in. | 1.333 |
| 12in. | 10.75in. x 8.6in. | 1.250 |
| 12in. | 10¾in. x 8in. | 1.344 |
| 14in. rect. | 11in. x 8¼in. | 1.333 |
| 14in. rect. | 11in. x $8\frac{9}{16}$in. | 1.285 |
| 14in. | 11⅛in. x 8¼in. | 1.348 |
| 15in. | 12½in. x 10in. | 1.250 |
| 16in. | 12¾in. x 10in. | 1.275 |
| 16in. | 13⅝in. x 10¼in. | 1.329 |
| 16in. | 13⅝in. x 10¼in. | 1.329 |
| 16in. | 13⅝in. x 10¼in. | 1.329 |
| 17in. rect. | 14½in. x 11in. | 1.318 |
| 17in. rect. | 14¼in. x 11⅜in. | 1.296 |
| 17in. rect. | 14⅜in. x 11in. | 1.307 |

Although the true picture ratio of breadth to height should be 1.333, the figures will be seen to vary from 1.250 to 1.348. For incorrect ratios, this means that if the breadth and height controls are adjusted to make the picture just touch the mask edges then the subject matter in the picture will be distorted, while if the controls are set correctly some of the picture is lost. Even for the same size diameter tube, the picture sizes vary considerably and that brings into focus the extreme maximum and minimum picture size which is possible for the same diameter tube, a point which I have emphasised during the course of at least a dozen lectures given during the past year or two on " A Survey of Television Development and its Problems."

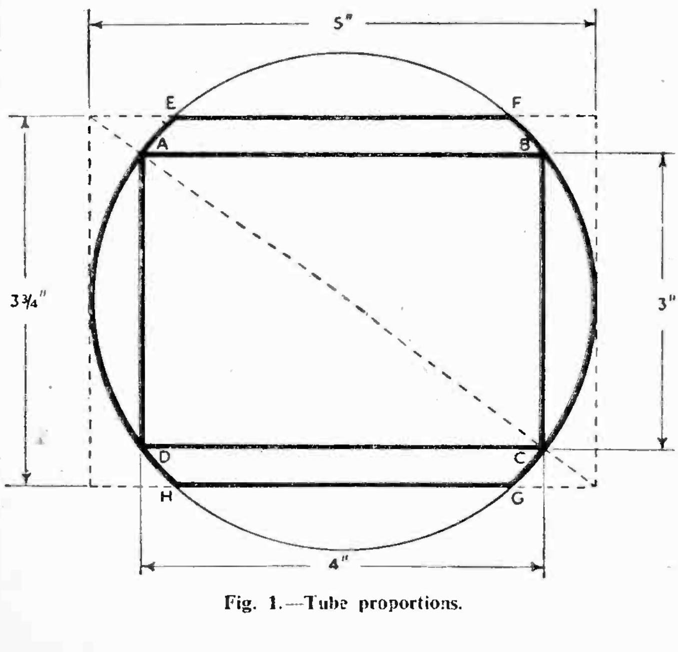


Fig. 1.—Tube proportions.

### Diagonal or Area

This will be made clear by a reference to Fig. 1. With a tube diameter of 5 units and a square cornered picture of true ratio, namely ABCD, the dimensions are 4 units width, 3 units height and 5 units diagonal. If, however, the practice followed by many American companies was copied by taking the picture width as the full diameter of the tube, then the picture shape would be as EFGH, giving 5 units width,

$3\frac{3}{4}$ units height and an extrapolated diagonal of $6\frac{1}{4}$ units on a 5-unit diameter picture ! This produces an increased picture area of over 30 per cent. with the same diameter tube and only loses the corners of the picture where, as a rule, programme action is seldom located.

Depending on mask shape, therefore, it is possible for a manufacturer to give picture dimensions with a 25 per cent. variation in each direction. Even the diagonal dimension does not, unfortunately, tell the true story unless quite a number of other factors relating to boundary conditions are provided.

In the case of projection receivers, the difficulties associated with a direct-viewing cathode-ray tube face are absent, as the picture is seen as either a back or a front projection on a flat screen. At first sight, therefore, it would seem that the fairest way to give a true indication of picture size would be to give the length of the diagonal in inches, as this would enable a comparison to be made with the direct-viewing tube diameter. This is not so, however, for although the physical dimensions of the picture in terms of breadth and height are easy to measure, again it is possible to have pictures with either square or rounded corners. If, therefore, only the diagonal was given as a measure of the picture size, the same dimension can be made to apply to two different size pictures. This is made clear from the table and Fig. 2.

In the case of models intended for cabinet back projection, it will be obvious that the square cornered picture at each throw distance is approximately equal in size to the rounded-cornered picture at the next smaller throw distance. A true interpretation of the picture size DE is only possible by extrapolating the diagonal A so that it meets the junctions of the vertical and horizontal edges of the picture.

For square-cornered pictures, therefore, the diagonal dimension A gives a true interpretation of picture size but, if advantage is taken of the rounded corners, then for the same throw distance—that is, the same optical system—the breadth of the picture can be increased by 2in. and the height by $1\frac{1}{2}$in. and a figure larger than A should really be given to furnish the subscriber with a true idea of the picture dimensions.

In summary, therefore, to state that a picture has a certain diagonal dimension only gives a true assessment of picture size in the case of a projection picture with square corners. With a rounded cornered projection picture, the increased breadth and height is only made manifest by giving the length of the extrapolated picture diagonal. The multiplicity of picture shapes with direct-viewing tubes makes the problem still more complicated.

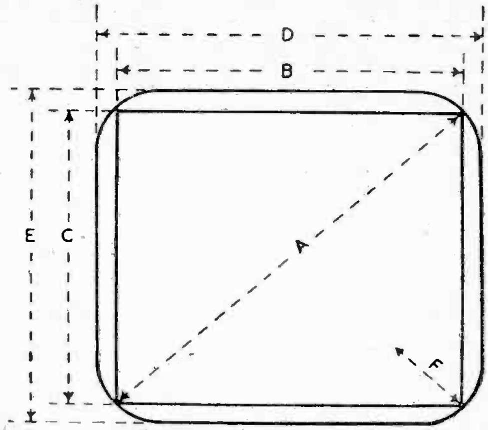



Fig. 2.—Showing how the diagonal measurement could mislead.

**The Solution**

After careful consideration, therefore, it would seem that the problem can only be met correctly in the case of projection pictures by giving width, height and area. This will immediately bring into prominence the advantage of size with projection picture over other types since it is in no way circumscribed by curved edges, as in EH and FG of Fig. 1. If it is decided to give a diagonal dimension alone, then it should be stated whether this dimension is actual or extrapolated, otherwise the advantage is lost (see A of second diagram).

With direct-viewing tubes, the only fair way is to give picture width, height, area and tube diameter. If only a diagonal dimension is provided, then again it should be stated whether this is actual or extrapolated. In any case, it is quite obvious that the manufacturers of television receivers should combine in an effort to regularise the whole matter and if a choice has to be made for *one* dimension to give the fairest indication of picture size, then the best compromise seems to be the diagonal.

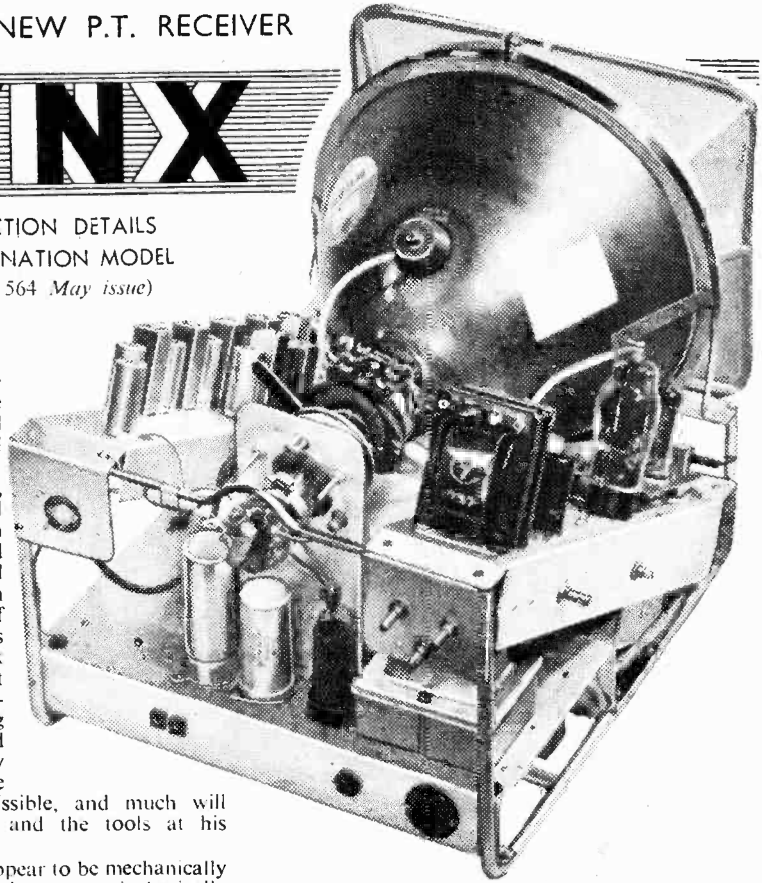
| | 4 : 3 Picture with Square Corners | | | | 4 : 3 Picture with Rounded Corners | | | | |
|---|---|---|---|---|---|---|---|---|---|
| System | Diagonal "A" in. | Width "B" in. | Height "C" in. | Throw in. | Diagonal "A" in. | Width "D" in. | Height "E" in. | Radius of Rounded Corners "F" in. | Throw in. |
| 10933/17 | 15 | 12 | 9 | $25\frac{1}{2} \pm \frac{3}{8}$ | 15 | 14 | $10\frac{1}{2}$ | $2\frac{5}{8}$ | $25\frac{1}{2} \pm \frac{3}{8}$ |
| 10933/25 | $17\frac{1}{2}$ | 14 | $10\frac{1}{2}$ | $30 \pm \frac{1}{2}$ | $17\frac{1}{2}$ | 16 | 12 | 3 | $30 \pm \frac{1}{2}$ |
| 10933/15 | 20 | 16 | 12 | $32\frac{1}{2} \pm \frac{5}{8}$ | 20 | 18 | $13\frac{1}{2}$ | $3\frac{3}{8}$ | $32\frac{1}{2} \pm \frac{5}{8}$ |
| 10933/19 | $22\frac{1}{2}$ | 18 | $13\frac{1}{2}$ | $37\frac{1}{2} \pm \frac{3}{4}$ | $22\frac{1}{2}$ | 20 | 15 | $3\frac{3}{4}$ | $37\frac{1}{2} \pm \frac{3}{4}$ |
| 10933/23 | 50 | 40 | 30 | 86 | 44 | 40 | 30 | $7\frac{1}{2}$ | 78 |
| 10933/21 | 60 | 48 | 36 | 104 | 52 | 48 | 36 | 9 | 95 |

THE NEW P.T. RECEIVER

# The LYNX

## CHASSIS CONSTRUCTION DETAILS FOR OUR NEW CORONATION MODEL

*(Continued from page 564 May issue)*



It is essential in the design of this receiver, in view of the unit form that the assembly takes, to complete the general framework and fit the various chassis and brackets in their correct positions before punching, assembly of components and wiring is attempted. Each unit can then be assembled and wired as an individual item, and will fit in position without the necessity of additional metalwork. As described here, the framework size is to suit a 12in. tube, but with the necessary front support modifications, the fitting of a 14in. rectangular should not prove difficult. In any case, some tolerance on the general metalwork is permissible, and much will depend on the constructor and the tools at his disposal.

Although the design may appear to be mechanically complicated at first glance, the system is basically simple and can be built up by the average constructor with the aid of only a few common tools. The main framework assembly and the construction of this should be tackled first of all.

The two side rods shown as items 6 with the cross braces items 7 form the main skeleton, and are cut and bent from ⅜in. diameter aluminium or dural rod. The aluminium is rather easier to work but the dural is better from the point of view of hole tapping. For the side members, two lengths each of 36in. are required, and for the cross pieces two lengths each of 14in. are sufficient. These lengths make allowance for final cutting and trimming wastage after bending, etc., has been completed.

The side members should be bent to the required radius of 1½in. front and back ; a piece of stout piping of about 1¼in. radius may be used as a guide, but the actual result is in no way critical. Fig. 5 shows a simple method of making the bends when a vice is available and is self explanatory. It is more essential to ensure that both members are identical rather than that the cornering is to the exact radius stated, and that the three resulting " sides " are in one plane. After bending, the front and rear uprights can be cut to their correct lengths of 5in. and 9½in. respectively.

The cross members should now be shaped at their ends as the inset of Fig. 4 shows, and then fitted in the positions indicated. It is essential that these members are of the same length. Both members are tapped 6 B.A. to a depth of about ¼in., the side members being drilled to clear and countersunk. Every effort should be made to ensure that these drillings are central in all rods, and although this is difficult without a drill press or lathe, care with an ordinary hand brace will produce a good job. The framework when bolted together should stand reasonably square, but slight errors can be corrected later when the other chassis items are fitted.

The front control bracket (item 5) should next be bent as shown in detail in Fig. 6 (a), together with the two curved tube mask supports (items 4) shown at (b). These items are fitted to the framework as indicated in Fig. 4, the ⅜in. rods being drilled through 6 B.A. clear for the bolting of the control bracket, and tapped at the ends of the front upright sections 4 B.A. to a depth of about ½in., for the fixing of the tube supports. These latter curved pieces are also bolted (with countersunk 6 B.A. bolts) to item 5 at the centre butt joint.

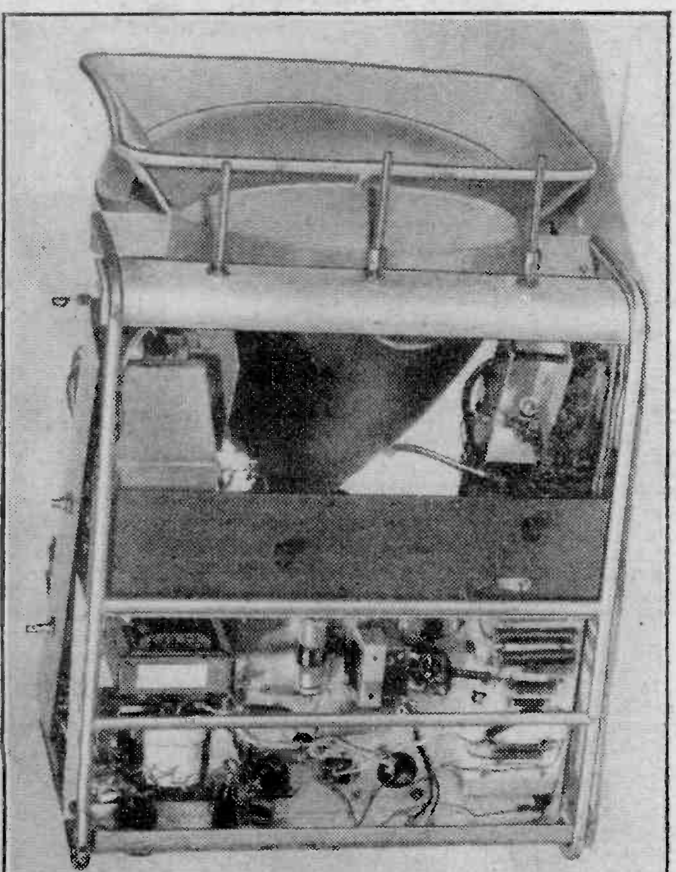
The power unit chassis should now be prepared to the details given in Fig. 7, and then drilled and fitted as indicated in Fig. 4. The curved side of the chassis is bolted to the rear rod uprights with 6 B.A. bolts and nuts, the front straight side being similarly bolted to the cross member (a). When fitting this chassis, as well as the control bracket at the front, care must be taken to ensure that the end sections of the side frame rods are perfectly vertical, and that the base is substantially flat when standing on a level surface.

The rear cross member (item 1) is now prepared. This is made from a 16in. length of ½in. diameter aluminium or dural rod, and is bent at the mid-point as shown. Again, the exact size of the bend is not critical, it being made merely to clear the tube base-holder when this is fitted. The ends of this rod are then cut to the correct width of 14in., and filed to sit on the top of the two main uprights. Fixing is accomplished with 6 B.A. countersunk screws tapping into the latter rods, as the detail inset of Fig. 4 shows.

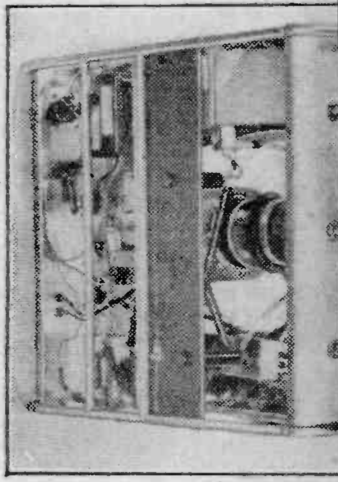
The brackets (items 2 and 3) should next be cut and shaped as sketched in Fig. 6 (c). The three pre-set control holes in item 3 are best cut when the actual components are available, as difference in case sizes of various manufacturers makes it impossible to give fixed dimensions. The three components should in any case be mounted as close to the bottom edge of this bracket as possible to avoid fouling the timebase components when finally assembled. Fixing to the rear uprights and the cross member is as indicated in Fig. 4.

The two sloping side chassis for the vision strip and the timebases respectively can now be folded to the detailed dimensions of Fig. 8 and fitted between the rear brackets and the top shelf of the control strip at the front. Two fixing holes are drilled in each end flange for assembly, and it is advised that the self-tapping type of screw be used for this purpose, the undersides of the shelves, especially that of item 3, being not readily accessible for the use of ordinary nut and bolt fixing when the units are fully assembled and wired.

The length of these side chassis is given as 16in. with 1in. end flaps; if the dimensions of the main framework have been faithfully copied, this size will be correct, but it is advisable to check on the actual length of the slope between the fixing shelves before finally cutting the metal of the chassis. Slight errors can then be covered by adjustment of the length necessary.



This underside view shows the curved front strip.



Another underside view t

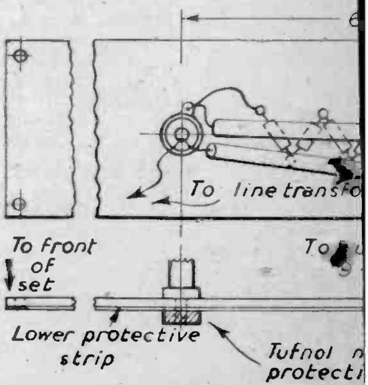



Fig. 9.—Details of the E.

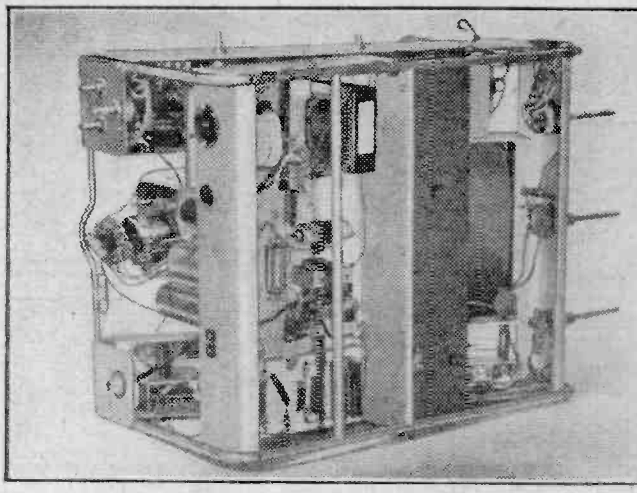
**E.H.T. Strip**

The final item of this preliminary preparation is the E.H.T. strip, shown in Fig. 9. This is a strip of ⅛in. paxolin (minimum thickness) cut and drilled to the dimensions shown, and it is essential that only a *first quality* insulant be used. The board should be new, free from blisters and cracks, and *quite dry*. Failure to observe this at first will lead to E.H.T. "frying" and corona troubles later on when the unit is working. A second strip of 1/32in. paxolin or bakelite (again a minimum thickness) is cut to back the above sheet and so insulate the underside against accidental handling, or contact against some other object that may be placed beneath the chassis when it is finally mounted in a cabinet.

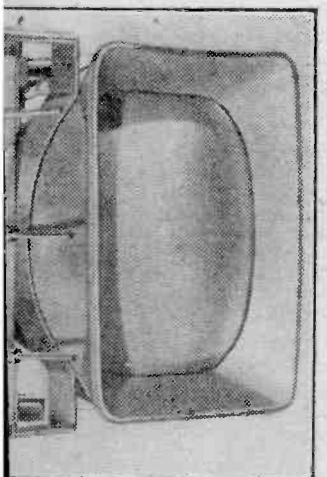
The staggered row of tags for the 2 M$\Omega$ bleeder on this strip (6 resistances of 330 K$\Omega$ in series making up $R_{48}$) are best riveted in position, but ordinary soldering tags and 8 B.A. bolts and nuts may be substituted. The bolts should be countersunk, with the heads let into the underside of the strip, the nuts being on the top. Sharp projections must be avoided, and all soldered joints should be well-rounded blobs.

The figure shows the layout of the three 6 kV. working condensers ($C_{47}$, $C_{48}$ and $C_{49}$), and the two metal rectifier pencils $MR_1$ and $MR_2$, in addition to the actual drillings. The fixing bolts at the bottoms of the condensers are used to attach the thinner underside protecting strip to the main board; two of these bolts are "hot," and if possible should be covered to avoid accidental contact. The side view shows the method used to achieve this on the original design. The actual fixing nuts are replaced by Tufnol "nuts," tapped blind, and screwed on firmly from the underside. If the constructor cannot make such a special fixing as this, the projections should be well taped-over with good quality insulant. The third condenser is, of course, earthed, and no special protection of this sort is necessary.

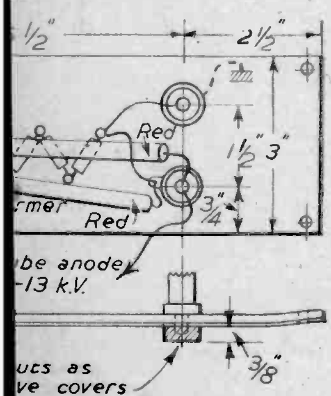
(*To be continued.*)



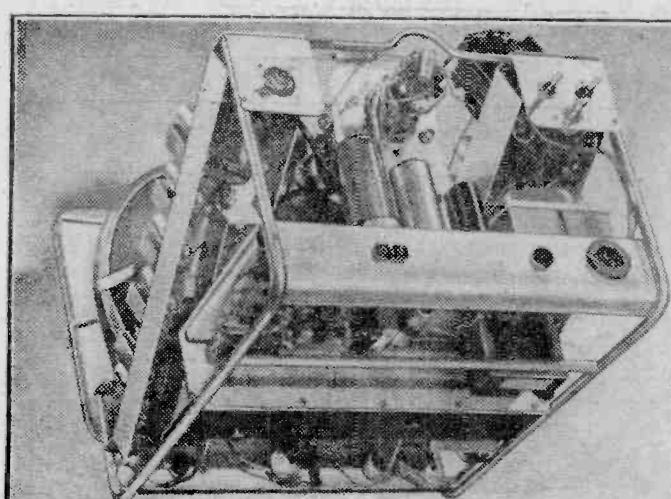
Underside three-quarter rear view of the chassis.



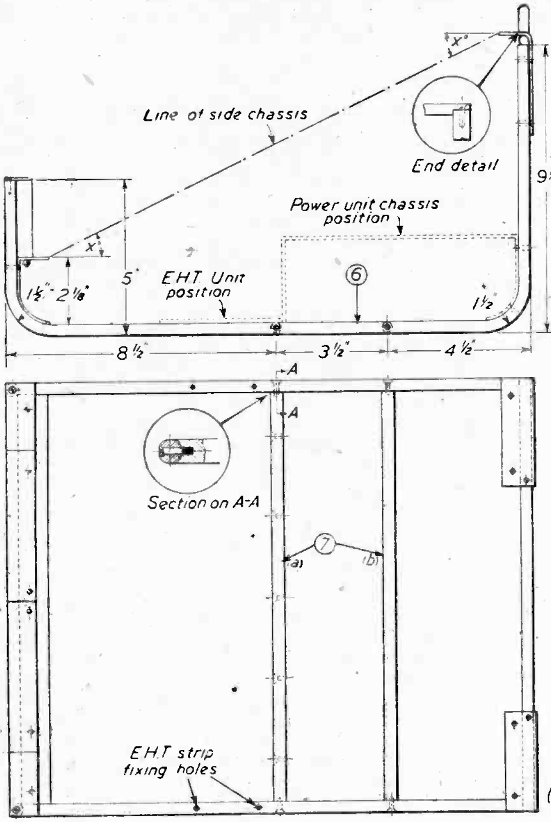
show chassis details.

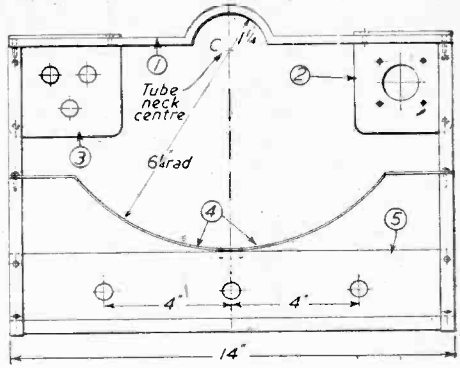



I.T. mounting strip.



Further chassis details may be seen in this view.



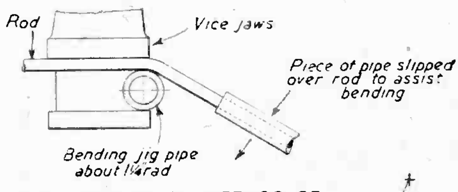




FIG. 5 SUGGESTED METHOD OF BENDING SIDE MEMBERS OF CHASSIS

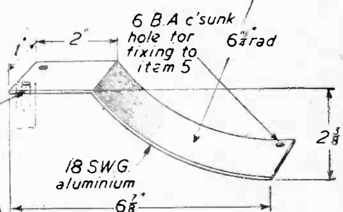



FIG. 4 GENERAL FRAMEWORK ASSEMBLY. DETAILS OF THE VARIOUS ITEMS ARE GIVEN IN FIG. 6

FIG. 6(b) ITEM 4 (L.H. MEMBER)

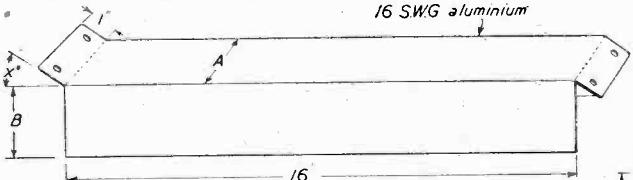



FIG. 8 TIME-BASE & VISION CHASSIS DETAILS 18 S.W.G. ALUMINIUM

Width A Vision 3" Time-base 3½"
Depth B Vision 1½" Time-base 2⅛"
Angle x to fit to similar angle shown in side view fig. 4

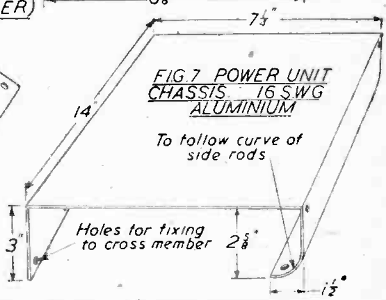
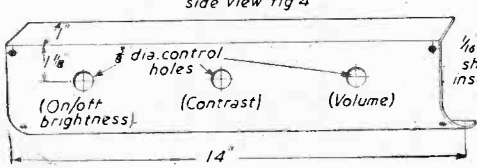



FIG. 7 POWER UNIT CHASSIS 16 S.W.G. ALUMINIUM



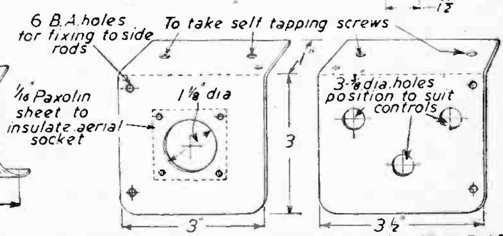




FIG. 6(a) ITEM 5 16 S.W.G. ALUMINIUM

FIG. 6(c) ITEM 2 16 S.W.G. ALUMINIUM ITEM 3

**Figs. 4 to 8.—Chassis cutting, bending and assembly details.**

# TV for the Beginner—3

A NEW SERIES EXPLAINING THE PRINCIPLES OF RECEPTION FOR THE NEWCOMER TO TELEVISION—THIS MONTH WE DEAL WITH THE CATHODE-RAY TUBE : GRID AND CATHODE MODULATION

By "Alpha"

(*Continued from page 542 May issue*)

MOST readers of this journal have an idea of the manner in which a cathode-ray tube functions, but to make clear the working of the time base we will run briefly over the basic principles.

Basically, the tube consists of an evacuated glass bulb, one end of which is coated with a material which will produce light (fluoresce) when struck by a beam of electrons. The more rapid the movement of the electrons, then the more concentrated is the point of impact and the brighter is the light produced within the limits of the capabilities of the fluorescent material.

The C.R.T. has been aptly referred to as an electron gun : electrons (minute particles of pure negative electricity) are generated by the cathode ; a very high potential on the anode attracts the electrons with great force, but a small hole situated in the centre of the anode plate allows some of the electrons to overshoot and they travel down the tube to the screen in the form of a beam.

In order to make the point of impact on the screen as concentrated as possible, methods are used to focus the beam so that a fine spot is seen on the screen. In the case of an electrostatic tube extra grids are inserted in the path of the beam, while in the electromagnetic tube an external magnet is employed.

Focusing is very important as the definition of the picture depends upon it ; it should be noted in this connection that the spot may not be truly circular, and as definition depends mainly on the verticals, it is wise to focus on the vertical parts of the picture (the central lines in the tuning-in clock, for example) rather than the scanning lines themselves.

For the best definition the tube heater should be supplied with current at its full rating to ensure the maximum number of electrons are produced by the cathode ; also, the maximum rated voltage should be applied to the final anode.

Now the arrangement described will produce a spot on the screen ; the next step is to make the spot move. Look at the diagrams in Fig. 11(a). We have a beam of electrons travelling up the tube and striking the tube face producing the spot (the inset shows the front view). The beam is negative, and if a metal plate is placed near the source of the beam and a negative potential applied, then the two negatives will repel each other. The plate is fixed, but the beam is not, and so the beam will move over to the left. (For front view of screen see inset Fig. 11(b).)

Should a positive potential be applied to the plate, then unlike kinds attract and so the beam will move towards the plate, Fig. 11(c).

It is fairly obvious that if we apply a voltage which varies from positive to negative repeatedly, the beam will move from left to right and back again, and if the movement is made fast enough the natural afterglow of the spot will cause a line to appear on the screen.

The same principles apply vertically, and if the plate is placed above the beam then the beam will move up and down.

Suppose we use two plates, one at the side and one above, and on the side one we connect an alternating voltage which is changing very rapidly, while on the other one we connect a voltage which is alternating comparatively slowly, then the beam will move rapidly sideways and slowly downwards, the net result giving a square pattern on the screen.

It is the slight afterglow which allows the pattern to be seen ; the point of impact of the beam will form a spot and this spot still keeps glowing after the beam has left it. It can, in fact, be kept glowing long enough for the beam to cover the face of the tube and to return to its original position striking the same spot again to give it a further fillip. This afterglow effect is aided by the natural persistence of vision of the eye, which will perceive an image for a short time after it has disappeared.

The material of the screen directly affects the afterglow and the period can be made very long or very short. (We are speaking of time in terms of microseconds.) In certain radar applications it is desirable to have a long afterglow so as to retain the image while the spot is busy elsewhere, while other radar applications require a minimum of afterglow.

Such cathode-ray tubes are referred to as "long persistence" and "short persistence," respectively. There is also an intermediate group termed "medium persistence."

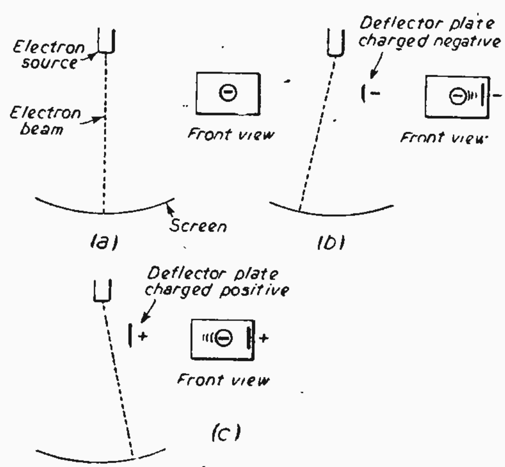



**Fig. 11.—Diagrams illustrating the movement of the beam or spot.**

Television deals with rapidly changing scenes and long afterglow is not desirable. Short persistence tubes should therefore be bought when ex-Government C.R.T.'s are to be used.

The pattern which is formed by the beam is termed the "raster" and the movement of the beam is called "scanning."

It is not possible to use the pattern just described for the production of a picture. In the studio the scene is scanned in a series of lines, the movement being comparatively slowly from left to right and very rapidly from right to left in the same way that you are reading this page. Your eye travels slowly along the line interpreting the intelligence contained in that line and then travels very rapidly from the end of the line to the beginning of the next. The same thing happens in the studio camera only instead of the written page, a scene is scanned, and in order to reproduce the scene on the C.R.T. our beam must move in a similar fashion.

To accomplish this the voltage on the plates is made to build up comparatively slowly in one direction, but reducing very rapidly in the other; it has the form shown in Fig. 12. It will be seen that the voltage formation is very much like the teeth of a saw and hence this particular kind of voltage waveform is termed sawtooth voltage.

The controlling effect of the plate (termed a deflector plate as it deflects the beam) on the beam can be increased by having two plates, one on each side of the beam, and we can apply voltages of opposite polarity, as shown in Fig. 13.

It is not necessary to use plates to control the beam as a magnetic field serves equally well. In this case coils are mounted on the neck of the tube and the current through the coils produces a magnetic field which diverts the beam in a manner similar to the movement of the wire in the armature of an electric motor; in the case of the tube the movement is horizontal or vertical, whereas in the motor, due to its physical construction, the movement is rotary.

C.R.T.'s which use plates to move the beam are called electrostatic tubes, and those which use a magnetic field are termed electromagnetic tubes (more briefly—magnetic tubes).

One great drawback to the electrostatic type of tube is that the plates have to be positioned in the neck of the tube, making the whole tube physically long, whereas with magnetic deflection a tube with a very short neck can be used. Commercially this means a saving in cabinet space—a not inconsiderable item. This is one of the reasons why magnetic tubes are used in commercial televisors.

Where magnetic deflection is employed a sawtooth current must be driven through the deflector coils and these currents are produced in the time base.

It will be noted that the great difference between the two forms is that for one type of tube, sawtooth *voltages* are required, while with the other, sawtooth *current* through the deflector coils is required; the design for the time bases of the two types is therefore very different.

The brightness of the beam can be varied at the cathode or grid by applying the correctly phased signal voltage. If cathode modulation is employed then to make the extra current flow in the beam we must make the cathode more negative than the grid. The grid is kept biased positively with respect to the cathode from a potentiometer network in the normal time base H.T. line; the control is labelled "Brightness." If peak white represents heavy negative on the cathode, then the grid becomes more positive with respect to the cathode and increased current will flow.

Where cathode modulation is used peak white drives the grid more positive. Some bias is retained on the grid by making the cathode positive with respect to the grid via a potentiometer in the time base H.T. line labelled "Brightness."

**Cathode or Grid Control**

Commercial televisors seem to favour applying the picture signal to the cathode. With this system the input to the video valve is positive, which means that the valve can be biased back almost to cut-off point and thus the full range of the valve characteristics can be employed.

When using grid modulation the video valve is very lightly biased and under no signal conditions draws very heavy anode current.

Car ignition is more troublesome with cathode modulation as the peak positives of the interference drive the video valve into grid current; grid modulation on the other hand means that ignition interference causes very heavy negatives driving the video valve into cut-off conditions. Provided that the video valve is correctly biased, interference limits are not needed in this case.

Grid modulation involves some difficulty in obtaining sufficient standing bias to prevent the video valve over-running during no signal conditions, yet retaining peak whites; with cathode modulation it is usually possible to obtain a brighter picture.

Some C.R.T.'s seem prone to the development of heater cathode shorts; where grid modulation is used no difficulty need be experienced and the heater circuit can be left floating by using a simple isolating heater transformer to feed the heater of the C.R.T. In cathode modulated circuits the same principle can be employed, but losses are liable to occur due to the capacitance between the windings; it is possible to obtain special low-capacitance transformers for isolation, but naturally they are more expensive.

Next, we will discuss the basic principles of time bases.

*(To be continued)*

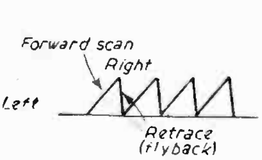



**Fig. 12.—The voltage wave shape or scanning trace.**

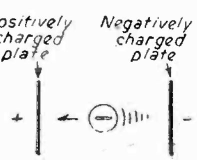



**Fig. 13.—Effect on the beam of two plates.**

# ALPHA RADIO SUPPLY CO.

### LOUD SPEAKERS

| | |
|---|---|
| 3in round type ... ... | 12/9 ea. |
| 3½in. Elac. square type ... | 13/6 ea. |
| 5in. units by Goodmans, Plessey, Waterhouse and Lectrona, all ... ... | 13/9 ea. |
| 6½in. units by Elac, Plessey ... ... ... | 14/6 ea. |
| 8in. units by Elac, Plessey ... ... ... | 17/6 ea. |
| 10in Rola ... ... ... | 32/6 ea. |
| 10in. Plessey ... ... | 19/6 ea. |
| Truvox 6½in. with output transformer ... | 16/6 ea. |
| Goodmans 6½in. latest type ... ... ... | 16/- ea. |
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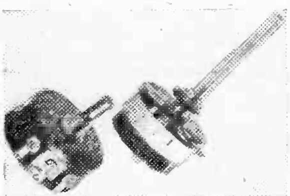
| Truvox heavy duty 12in., 15 ohms speech coil ... | £6.6.0 ea. |

### EX GOVERNMENT VOLUME CONTROLS

Some brand new others ex new equipment. Sizes available 500 Ω, 600 Ω, 10 K Ω, 20 K Ω, 25 K Ω, 50 K Ω, 100 K Ω, 200 K Ω, ¼ meg. Ω, ½ meg. Ω, 1 meg. Ω, 2 meg. Ω. All 1/- ea.

### WIRE WOUND CONTROLS

5 Ω, 200 Ω, 400 Ω, 1 K Ω, 2 K Ω, 5 K Ω, 10 K Ω, 15 K Ω, 20 K Ω, 25 K Ω, 35 K Ω, 50 K Ω, 2/6 ea.



### STANDARD VOLUME CONTROLS

**MORGANITE S.P.S.** ¼ meg. Ω, 1 meg. Ω, 1in. spindle, **2/9** ea.
**MORGANITE S.P.S.** ¼ meg. Ω, 1 meg. Ω, standard spindle, **3/9** ea.
**CENTRALAB S.P.S.** ½ meg. Ω, ¼ meg. Ω, 1 meg. Ω, 3/9 ea.
**MORGANITE** less switch, 1 meg. Ω, 50 K Ω, 2 meg. Ω, **2/6** ea

### ALLADIN COIL FORMERS

⅜in. and ⅜in. complete with iron dust cores. **9d.** ea.

### V.C.R. 137A TUBE

Complete with base and screen, **19/6** ea. Post and packing 1/6.

### CALIBRATOR UNIT

This unit consists of a standard power pack. 325-0-325 H.T. transformer, choke and 5Z4G rectifier. Along with 8 EF50 valves, 3 EA50, and dozens of resistors and condensers, **84/-** ea. Carriage 7/6.

### SCREENED GRID CAPS

Octal and British type, 3d. ea.

### COLLARO A.C. 49 RECORDING MOTORS, CLOCKWISE AND ANTICLOCKWISE, 59/6 pair.

**ROMAC TELEVISION RECEIVERS**
Table model, 189/190. 16 valves, complete in cabinet, less cathode-ray tube, these are brand new in maker's cartons, sold **NOT GUARANTEED.** Price **£27.10.0.** Plus 25/- carriage and insurance. Brimar tube can be supplied at **£18.8.0.** Plus carriage and insurance.

## VALVES

**Guaranteed new and boxed. Majority in maker's cartons.**

| | | | | | |
|---|---|---|---|---|---|
| OZ4 | 7/- | 6K7GT | 6/6 | ME91 | 7/6 |
| 1A5GT | 8/- | 6K8G | 10/6 | MS/PEN SP4 | 5/- |
| 1C5GT | 8/6 | 6K8GT | 10/6 | OM9 | 9/- |
| 1G6GT | 7/- | 6L7M | 7/6 | Pen25 | 8/6 |
| 1H5GT | 10/- | 6Q7G | 10/- | PEN220A | 4/9 |
| 1L4 | 8/- | 6Q7GT | 10/- | PL82 | 11/6 |
| 1LA4 | 4/6 | 6SA7GT | 9/- | PM202 | 4/6 |
| 1R5 | 8/6 | 6SG7 | 9/- | PY80 | 11/6 |
| 1S4 | 8/6 | 6SH7 | 6/- | R12 | 14/- |
| 1S5 | 8/6 | 6SJ7 | 10/- | UB41 | 9/- |
| 1T4 | 8/6 | 6SK7 | 7/- | UF41 | 12/- |
| 1U5 | 10/6 | 6SL7 | 9/- | UY41 | 10/- |
| 215SG | 4/- | 6SN7GT | 10/6 | VR21 | 3/6 |
| 2X2 | 5/6 | 6SQ7 | 9/6 | EF39 | 7/6 |
| 3A4 | 9/- | 6U5G | 9/6 | EB34 | 3/6 |
| 3D6 | 8/6 | 6V6G | 8/6 | EBC33 | 8/- |
| 3S4 | 10/- | 6V6GT | 8/6 | EF36 | 7/6 |
| 4D1 | 4/- | 6V6M | 9/- | SP61 | 4/- |
| 42 | 8/6 | 6X5GT | 7/9 | SP41 | 3/6 |
| 5U4G | 9/- | 80 | 9/- | EF50 | 6/6 |
| 5Y3G | 8/6 | 220TH | 10/- | EF50 Syl | 8/- |
| 5Y3GT | 8/6 | 807 | 10/- | EA50 | 2/6 |
| 5Z4G | 9/- | 8D2 | 3/- | ECH35 | 13/- |
| 6A8G | 11/- | 954 | 2/- | VR116 (V872) | 4/- |
| 6AG5 | 8/6 | 955 | 5/- | EF8 | 6/6 |
| 6AK5 | 8/6 | 956 | 3/6 | VR150/30 | 10/- |
| 6AL5 | 8/6 | 9D2 | 3/- | VR137 | 5/- |
| 6AM6 | 9/6 | DDL4 | 4/- | EL32 | 8/- |
| 6B4 | 8/- | DET19 | 6/6 | KT44 | 7/6 |
| 6B7 | 8/- | EB41 | 10/6 | VT105 | 4/- |
| 6B8 | 7/- | EBC41 | 11/6 | TT11 | 6/- |
| 6BE6 | 11/6 | ECH21 | 11/- | VP23 | 8/- |
| 6C4 | 8/6 | ECH42 | 10/6 | VU39 (MU 12/14) | 9/- |
| 6C6 | 7/6 | ECL80 | 12/- | VU111 | 3/6 |
| 6C9 | 8/- | EF36 | 7/6 | VU120A | 3/6 |
| 6D3 | 8/- | EF41 | 11/6 | VU133 | 3/6 |
| 6D6 | 7/6 | EF80 | 11/- | W77 (EF92) | 8/6 |
| 6F6G | 8/- | H63 | 7/9 | X18 | 9/- |
| 6F6M | 9/- | HL23DD | 8/6 | X66 | 13/- |
| 6F8G | 7/- | KT33C | 11/6 | Y63 | 9/- |
| 6G6G | 7/- | KT61 | 10/6 | | |
| 6H6 | 4/6 | KTW61 | 8/9 | | |
| 6J5GT | 5/6 | KTZ41 | 6/9 | | |
| 6J7G | 6/6 | KTZ63 | 6/6 | | |
| 6K7G | 6/6 | MH4 | 5/6 | | |

**STOP PRESS — Budget Reductions. Deduct 6d. off all above Valve prices.**

### COLLARO AC37

Gramophone motor, variable speed, manual adjustment. 4-pole shaded-pole type, 100/130 v., 200/250 v., complete with 10in. E.M.I. type turntable. **46/-** each, post 1/6.

### MAINS TRANSFORMERS

**MT1** PRIMARY. 200-220-240 v. SECONDARIES. 250-0-250 v., 80 ma.. 0-4 v. ; 5 a.-6.3 v. ; 4 a. 0-4 v.-5 v. 2 a. **17/6** ea.
**MT2** as above, but with 350-0-350 H.T. winding ... ... ... ... **17/6** ea.

### CABINETS

Size 10 x 7 x 5, approx. Cream or Brown. Complete with chassis and back, **15/6** ea. Post 1/6.

### PANELS

We have a quantity of condenser and resistor panels, removed from new ex Government equipment. All contain a good selection of resistors and condensers, 6 types available, **1/3** ea., or 6 for **6/6**.

### FOUR TV VOLUME CONTROLS

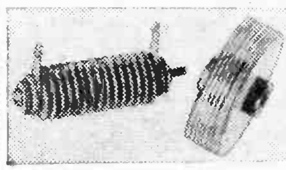
Sizes 50K carbon S.P.S., 750 Ω wire wound. 25K carbon, 5 k Ω wire wound. Mounted on a bracket with flexible lead, with 1 4.7 k Ω resistor and 1 5 watt wire wound fixed resistor. Complete, 8/- ea.

### INDICATOR UNIT TYPE 6L

Contains 1 VCR97 tube, 4 EF50, 3 VR54, 10 wire wound controls, and all condensers and resistors. In perfect condition, **72/6**, carriage 7/6.

### METAL RECTIFIERS

12 v. ½ a., **1/6** each ; 2 to 6 v. 1 a., **3/-** each ; 12 v. 1 a., **4/9** each ; 12 v. 5 a., **18/6** ; 250 v. 45 mA., **6/9** each ; 250 v. 75 mA, **9/6**. 300 v. 60 m/a, **7/6** ; 12 v. 2 a., **10/6**.



**S.T.C.** RM1, **4/-** ; RM2, **4/6** ; RM4, **16/-**.

### HEAD PHONES

High Resistance Type, 4,000 Ω per pair, **10/-** pair ; Low Resistance Type 120 Ω per pair, **7/6** pair.

### TRANSFORMERS. SPECIAL OFFER

**T1.** 320-0-320 v. 95 mA., 6.3 v. 3.1 a., 4 v. 2.5 a., **15/-** each.
**T2.** 445-0-445 v., **15/-** each.
**T3.** 265-0-265 v., 4 v. 2.5 a., 6.7 v. 7 a.. **15/-** each.
**T4.** Filament type 4 v. 2 amp., 7/6 each.
**T5.** Filament type, 4 v. 3.75 a., 4 v. 6.9 a., **8/6** each.
All the above are rated for 220 v. input. Carriage and packing 1/6 each.

### CONDENSERS METAL-CASE TYPE ELECTROLYTICS

8 mfd., 450 v., **1/11** each ; 16 mfd., 450 v., **3/3** each ; 16 x 16 mfd., 450 v., **4/9** each ; 16 x 8 mfd., 450 v., **4/6** each ; 8 x 8 mfd., 450 v., **4/-** each ; 25 mfd., 25 v., **1/3** each ; 32 mfd., 350 v., **1/9** each ; 32 x 32 mfd., 350 v., 25 mfd., 25 v., **5/3** each.

**TERMS** : Cash with order or C.O.D. **MAIL ORDER ONLY**. List available, send **3d.** in stamps.
Postage **6d.** under **10/-** ; **1/-** under **20/-** ; **1/6** under **40/-**. Minimum C.O.D. and postage charge, **2/3**.

## 5/6 VINCES CHAMBERS, VICTORIA SQUARE, LEEDS, 1


### Film Channels for Italy

R.A.I. Radio Italiana of Turin, Italy, have ordered 2 flying spot film channels from Emitron Television Ltd. These equipments will operate on 625 lines 25/50 frames interlaced and are to be used at the new Italian Television Station at Turin. Similar in principle to the Emitron film channels used by the BBC, facilities for both 35mm. and 16mm. film and lantern slide operation are provided.

Delivery of these two equipments will take place in a few months.

### Death of Mr. Simon Orde

THE death occurred on April 23, of Mr. Simon Orde, Engineering Information Department Manager

Mr. Orde joined the BBC in 1942 as a censor in the wartime American Liaison Unit, transferring to the Engineering Division in 1943. His work made him widely known outside the BBC both in this country and overseas. He was 59.

### Television Licences

THE following statement shows the approximate number of television licences issued during the year ended March, 1953. The grand total of sound and television licences was 12,892,231.

| *Region* | *Number* |
|---|---|
| London Postal ... ... | 719,889 |
| Home Counties ... ... | 244,555 |
| Midland ... ... ... | 463,767 |
| North Eastern ... ... | 237,077 |
| North Western ... ... | 273,456 |
| South Western ... ... | 64,199 |
| Welsh and Border ... | 76,507 |
| Total England and Wales ... ... ... | 2,079,450 |
| Scotland ... ... | 62,444 |
| Northern Ireland ... | 558 |
| Grand Total ... ... | 2,142,452 |

### Young People's Survey

TELEVISION and its effects have been described in the past as "menacing" and by some as "evil."



In a recent television survey, taken by a group of young people in Staveley, Derbyshire, their feelings towards the medium are summed up in the statement: "We have not surrendered to the drug."

### Boxing From Manchester

PERMISSION has been given by the British Boxing Board of Control for the televising of the boxing tournament at the Free Trade Hall, Manchester, on May 27.

### No Publicity for Medicine Men

IN a recent notice by the British Medical Association, doctors are warned that they must not take part in any TV broadcast which would bring publicity to themselves.

Their names must be kept secret, the notice says, and no clues are to be given to the doctor's identity.

### Hope for Aberdeen

WHEN he visited Aberdeen recently, the Postmaster-General, Earl de la Warr, said at a Chamber of Commerce luncheon that he could not give a definite date for the opening of a television service for north-east Scotland but added the assurance that consideration of Aberdeen's needs was "very high on the list."

### Ready by June

TEST signals received from the new "booster" station at Truleigh Hill are reported to be sharper and clearer than those received direct from Alexandra Palace, which means that reception will be greatly improved in the area from Peacehaven to Worthing on the Sussex coast.

The station is expected to be in full operation in time for the Coronation.

### Society's Own Transmitter

IN an effort to increase the export of British television receivers, the Television Society will build its own transmitter for the broadcasting of sales propaganda programmes to the Continent.

### Midget Receiver

ON view at the recent Sale Better Homes Exhibition at Sale Lido was a midget television set only four inches in height.

The minute knobs controlled a picture on a one-inch tube.

### TV Statistics

IT has been stated that of the people in this country owning television sets 60 per cent. earn less than £9 a week.

A total of 85 per cent. receive under £900 a year.

### Director's Claims

IN London recently, film director Anthony Asquith said: "The only thing that television can do better than the cinema is to convey immediacy, which is always exciting."

"But otherwise, there is nothing in television the films cannot do better."

### The Worth of Viewing

WHEN an Ashton-under-Lyne man told the judge that he had been without the amenities of television for thirteen weeks because of trouble with a firm of radio dealers over a cathode-ray tube, the judge ruled that the enjoyment of viewing television for one week was valued at ten shillings and awarded the viewer £6 10s.

**Sets for Old People**

TELEVISION receivers are to be installed by Essex County Council in all homes for old people.

In the larger homes, projection sets will be fitted costing, in all, £1,120, while the smaller type of receiver will be installed in other hostels.

**Instructor Wanted**

THERE is a vacancy on the staff of the Islington Men's Evening Institute for a part-time instructor in wireless (short wave) in connection with a class group of practical short-wave radio enthusiasts who have been attending for a considerable period. The group is in need of an instructor with appropriate knowledge in the subject who would also have an interest in the club life of the group. The classes concerned meet on Monday and Friday evenings from 7.30 till 9.30, the rate of pay being £1.7s. per attendance.

Those interested should apply to The Principal, Mr. C. T. Bird, Islington Men's Evening Institute, Robert Blair School, Blundell Street, Holloway, London, N.7.

**Colour Development**

IT is reported from the United States that the Radio Corporation of America has developed a new system for receiving colour television pictures on a normal black-and-white receiver without any special adjustments.

**Budget Hits Dealers**

BRIGHTON radio dealers, knowing that the new booster station at Truleigh Hill would soon be in operation, bought up large stocks of receivers ready for the new demand. They now have cause for regret.

The receivers are sold to the public at the new reduced budget prices. The dealers bought them at the old purchase tax rate.

**Sweden sees BBC Equipment**

A GROUP of Swedish television experts has just completed a tour of the BBC's Television studios, including the large variety Studio "G" which is entirely equipped with Pye cameras and associated transmission gear. The Swedes were impressed with British "know-how" and the up-to-date apparatus being used by the BBC.

Gilbert Harding, well known to viewers, and Sir Compton Mackenzie, who has also appeared before the TV cameras, chat with a girl student at King's College, Aberdeen University, after a debate in which they were the principal figures.

**Belgian Contract**

PYE LIMITED has secured the contract for supplying equipment for two complete TV studios for "Institut National Belge de Radiodiffusion" (I.N.R.)—the Belgian television service. The total amounts to some £70,000.

Many firms, including some from Germany, Holland, France and America, competed for the Belgian order. One of the outstanding features of this equipment is that it will operate on both 819- and 625-line systems, only a simple switch being necessary for the changeover.

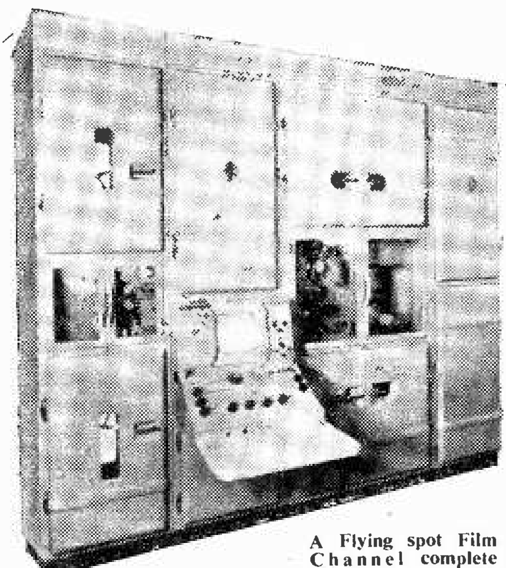
Test transmissions are due to commence in the autumn of this year.

**"And The People Rejoice"**

ON June 15, the BBC is to show a 75-minute film entitled "And The People Rejoice," showing how the rest of the world looks upon the crowning of the new Queen.

Films will be sent from countries all over the world including the Commonwealth and will be edited by the BBC Film Unit.

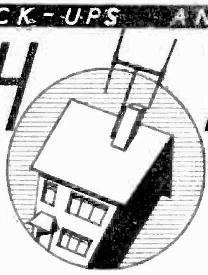
This is the first TV film to be made with world-wide co-operation.



A Flying spot Film Channel complete with 16mm. projector, 35mm. projector and slide projector. The equipment is housed in the following cubicles, (left to right); 16mm. projector bay; Emiscope unit, monitor and control bay; 35mm. projector and slide projector bay (double sized); channel amplifier and power supply bay.

TELEVISION PICK-UPS AND REFLECTIONS

# UNDERNEATH THE DIPOLE



*By Iconos*

## "C.B."

ONE of the most refreshing characteristics of the British lay Press is its lack of unanimity on almost every subject under the sun. Since TV critics became fashionable in the columns of the daily and evening papers their opinions have differed in the traditional manner, especially on the matter of TV plays.

"Mr. Cochran Presents—" was a case in point. There was another instalment of "The Passing Show," produced by Michael Mills, and again we were presented with a scrap-book biography of the achievements of the great impresario and showman, C. B. Cochran. Like the Marie Lloyd story, the narrative provided a series of links for musical excerpts from "Little Nelly Kelly," "This Year of Grace," "Fun of the Fayre," and other stage productions, musical and otherwise, not to mention the boxing, wrestling and other sporting enterprises of the great "C. B." An enormously broad canvas was attempted by Michael Mills and it would be churlish to blame him for the picture being imperfect in part.

## NO BUSINESS LIKE SHOW BUSINESS

MY rough guess is that this production covered about 700 camera cuts from shot to shot, including interpolations from film—and 30 or 40 different settings, most of them small but quite adequate. Fine performances were given, by Frank Lawton as Charles Cochran, Melissa Stribling as his wife, Denis Price as Noël Coward. Vanessa Lee was outstandingly good in the musical numbers. Some of the film scenes specially shot for the show were disappointing in picture quality, but the production as a whole was very good entertainment. We could do with more of these show business biographies. What about the Melville Brothers (melodrama kings), the Stoll Story (music hall magnate), Gilbert and Sullivan (operetta) and Fred Karno (burlesque comedy)? Show Business makes very good TV, even if it suffers from it as a competitor.

## MOONSHINE

SOME time back the TV production of "Dial M for Murder" led the author not only to viewers' acclaim, but also to success in the West End and worldwide film offers. We now salute a new discovery in the TV playwright field, John Coates, with his highly amusing "Moonshine." Coates has the uncanny gift of making this most improbable "eccentric comedy" appear quite possible. He gives us the fantastic Aunt Daisy from Sark, a reputed witch who rocks the Ransom middle-class household with her magic, in which part Mary Merrall gave a wonderful performance and made us realise that witches are not always evil. Hal Burton's production was all Mr. Coates could wish for. I look forward to meeting Aunt Daisy again!

## NEWSLESS NEWSREELS

TV viewers were fortunately placed during the Easter holiday as regards newsreel coverage. Cinema newsreels were bogged down by an overtime ban which prevented all filming from Good Friday to Easter Monday, inclusive. Cinema newsreels, rapidly fading from the screen, cannot long survive the internal squabbles, unofficial strikes and political interference which wracks this particular industry. And yet the editorial contents of the newsreels, both TV and cinema, are remarkably free from political bias from any quarter. The same cannot be said about the documentary side of TV which sometimes takes on quite a sinister aspect. The Witch Hunt idea does not appeal very much to British people, but at the same time it is only common sense that propaganda weapons as powerful as TV should be in the hands of politically neutral persons. Propaganda and opinions can be initiated by omission as well as commission, as was done some time ago when the BBC put out its notorious propaganda film about life in Germany and Berlin. Televised at the height of the Berlin blockade, it omitted all reference to it. Both Government and Opposition sides of the House should watch the dynamic TV propaganda medium very carefully.

## THE BOFFINS' TRIUMPH

CORONATION requirements have forced the pace in all technical departments of the BBC and especially on the TV side. The long continuous programme on Coronation Day itself has brought its own special problems such as high-quality picture and sound recording of ceremonials lasting a considerable time. New combined picture and sound recorders have been specially designed for the job, in which two machines can be used alternately, recording the transmitted TV picture and its associated sound on the same film thus making a continuous record over a period of hours, if necessary. The mechanical arrangements of the cameras are based upon well-tried designs, but under normal circumstances they would only have to deal with recordings of short duration only. In this instance, the important problem of emulsion pick-up in the gate, nightmare of all newsreel cameramen as a source of scratches, has been overcome by an ingenious new system of lubrication. The whole job is a credit to the BBC Research Department and to the several British instrument and optical manufacturers who made contributions. Frankly, I'm surprised that magnetic recording wasn't used—but the specification calls for sound track and recorded TV picture to be in their normal relationship on one film—and the boffins carried out the whole design and construction in about four months.

# FOR THE EXPERIMENTER

## SOME LINES OF EXPERIMENT FOR THE STUDENT AND AMATEUR

By W. J. Delaney (G2FMY)

MANY radio amateurs find that their main interest is in trying out new ideas in circuitry, and generally keep spare apparatus for the purpose. In the case of television, however, in view of the large initial expense and the domestic entertainment which is afforded by the completed receiver, it is usually left alone and as a result experimental work is neglected. As television is a more or less new thing there are many interesting fields of research, and the keen experimenter will find ways and means of carrying out such work without interfering with the domestic receiver. For instance, a new section may be built up, tested experimentally—that is, with meters or 'scope—and then, perhaps, incorporated in the domestic receiver. If, however, a more or less rough-and-ready complete receiver is made up round ex-Service equipment, it is possible to carry out much more serious work, the results of which may later be confirmed by incorporation in the main receiver.

What lines of attack are open to the experimenter? The vision receiver must, more or less, remain on similar lines to that generally adopted to-day. High gain is required with a wide bandwidth and, apart from the use of multiple valves to reduce the overall size (and perhaps heater current loading), the only experiments available are in the way of widening bandwidth with adequate sound signal rejection. The technique here is, of course, on lines already familiar to most radio amateurs, and apart from multi-channel switching, etc., there is not apparently a great deal which can be done.

### Time Bases

It is in the circuits after the video stage where most experimental work may be carried out. For instance, the most important part of a circuit (from the picture point of view), is that which produces the interlace. This incorporates the sync. separator as well as the input to the frame time base. This part of the receiver has by no means reached finality, and an examination of commercial receivers will show a most varied selection of circuits. Ideas embracing from one up to four or five valves have been suggested as "interlace filters," and here is a most interesting field for experiment. The frame frequency is 50 (two 25's interlaced) and the A.C. mains frequency in this country is also 50 c.p.s. The latter is supposed to be accurately controlled at the power stations, and some way may be found of using the mains frequency to "lock" the frame. Here is a suggestion: perhaps an A.C. winding on the oscillator transformer could be introduced and controlled. Reference to oscillators brings to mind the fact that the oscillator circuits can vary enormously from transitrons to thyratrons. Some prefer the multi-vibrator, some prefer a self-running oscillator, others prefer a discharge valve in conjunction with a blocking oscillator, and so on. The use of multiple valves here, with perhaps some new type of oscillator, may prove a useful ground for experiment.

### Line Oscillator

In case some readers may think that there is little which can be done in this direction, mention may be made of a circuit which is used by Ferguson, in which the oscillator in the line time base has been dispensed with, the line amplifier being made to run as a self-oscillator. Various claims are made for this arrangement, in addition to the economy of saving a valve and its associated components. The auto-transformer, too, in the modern line time bases is of comparatively recent development and shows that existing schemes are by no means final. In most fly-back E.H.T. circuits the regulation is not ideal, and perhaps some improvement could be effected here in the interests of picture quality, but obviously with the usual safety precautions. The better the regulation the more dangerous becomes the supply, but defocusing on whites and variation in brilliancy with picture width control, as well as variation in size with brilliancy control, are all the results of poor regulation in the E.H.T., and this, therefore, offers quite a good field for experiment.

### The Future

If we pause to look at future trends there are two main lines which television is almost bound to follow. I refer to colour and stereoscopy. Colour is already beyond the experimental stage, but is expensive or cumbersome, depending on the system employed. Many research laboratories are engaged in experiment in this connection, but the amateur may have ideas which have not yet been tried out, and which are not beyond the scope of the average amateur workshop—that is, without specially made C.R. tubes. The introduction of 3-D in the cinemas makes it imperative that television should follow, but obviously without the use of special spectacles. Projection would probably have to be used, and it is possible that a domestic edition of the "wide screen" arrangement could be adapted. Unfortunately, the projection equipment is not at the moment available to the home-constructor, and, therefore, any experiments in this direction would have to be "on paper," but it is another interesting field for work.

### Records

With any form of development it is imperative that the amateur keeps adequate records. It is of little use making a rough sketch of a circuit idea, wiring it up, and on trying it and finding it not functioning as expected to scrap the circuit and dismantle the "hook-up." At some later stage a somewhat similar idea may crop up, and reference to the circuit would then show whether or not it was worth while going any further, and many fruitless hours can thus be saved. Similarly, an arrangement may be found to function partially in an expected manner, and the details, if kept, may be associated with other data at a later date, the combination of which may result in a successful scheme.

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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).

## SIGHT-STRAIN

SIR,—As a layman with no specialised knowledge of either optics or electronics, but sufficient superficial knowledge to build up my own TV set from ex-Service equipment, I would like to join battle with Mr. Stoneley and his views on TV sight-strain.

He says, and I agree, that the cinema is a generally accepted source of eye-strain ; but he attributes this solely to the contrast between the brilliant screen and the darkened hall. I would like to suggest that the cause of this strain is divided equally between this contrast and the presentation of 48 pictures every second.

Flicker is not perceptible to the human eye at this frequency due to the persistence of vision, but the fact remains that the flicker is there. The eye is being tricked into seeing a continuous image which appears to move, but it is only just deceived. One has only to wave one's hand, with the fingers spread out in front of one's face, to realise how very nearly visible the flicker is. This same effect is often apparent in artificial light (A.C. supply, of course) when there is load-shedding and the frequency drops. The eye is playing tricks on us in the cinema, with television and even in artificial light ; and although you and I think we are seeing a continuous image—in fact we are not. And that, I feel sure, is just as much a cause of strain as the contrast between the bright screen and the dark surroundings.

Mr. Stoneley seems determined to blind us with science, if TV and the cinema haven't done it for him already. His suggestion, when removed from the welter of pseudo-scientific technology, is merely that we should have green filters or tube-screens. Has he never viewed on a set with a VCR97 ? There is just as much strain viewing with a VCR97 (which, of course, has a green trace), even with a magnifier, as there is with a normal black and white 9in. tube.

I would like to suggest that, with care, the strain experienced when viewing TV can be very greatly reduced. Clearly, one cannot obviate the strain caused by the 50 frames per second picture frequency, and in TV this may be slightly greater with the flying spot building up the picture line by line—I don't know ; but there are three ways in which strain from other causes can be removed.

(i) The room should *not* be in total darkness—it does *not* reduce picture quality or enjoyment (even without a dark screen) to have light in the room. Light should not fall directly on to the face of the tube, and the source of light should be so placed as to prevent its being reflected by the glass of the screen. The presence of light in the room greatly reduces the contrast between the bright screen and the dark surround and hence also the strain it produces.

(ii) There is always a correct relative setting of the contrast and brilliance controls ; very often it changes with a change of camera, and with film transmission in particular it is difficult to keep pace with the changes. But changes there are, and to avoid eye-strain alterations to the settings must be made. Some people have their pictures so bright that one could easily read a book by the light the tube throws off—and they complain of eye-strain and headaches ! Others believe in the pale, watery picture where you can hardly see anything except the flyback lines. Between these two extremes there is a correct setting—and only one. If eye-strain is to be avoided, this setting must be found.

(iii) People will insist on sitting right up close to their sets and peering from a distance of a few inches. If they would realise that only a certain level of detail is transmitted, which can easily be seen at a distance of several feet, on the smallest of tubes, they would soon enjoy easier viewing.

Sit well back in your chair, do not peer at the screen, and from time to time look around the room and give your eyes a chance to focus elsewhere, and if you have followed the rest of my advice you will find that TV eye-strain is less than that caused by the cinema.

Finally, I would like to mention a device recently installed in a cinema in Cambridge. The screen is suspended in the middle of a grey surround which reaches to the top, bottom and sides of what, in a theatre, would be the stage. This surround automatically takes up the mean illumination of the screen proper and provides a transition between the very bright and the very dark ; this, in part, overcomes the contrast I mentioned earlier and the ill-effects it produces.—H. G. LAVINGTON EVANS (Somerset).

SIR,—In the article on the above subject by Mr. H. Stoneley, your April issue, he expresses the amazing opinion that the best viewing is made in the *dark* or in semi-darkness.

Surely from the very beginning of TV oculists have stressed the importance of room lighting when viewing !

To reduce strain I think the following factors should be considered :

Amount of light in the room and position of lamp.
Extent to which brightness/contrast are turned up.
Distance of viewer from the screen.

With regard to the first, I have found a 75-watt bulb mounted directly behind the set the most satisfactory, in order to soften the shadows and to give diffused lighting the bulb should be covered with a straw-coloured parchment shade. This is most important. Viewers, of course, cannot see the lamp.

With this arrangement there is a pleasant, background lighting to the screen, and as from time to time the eyes change their focus from the screen to the wall behind the set the effect is restful.

With regard to brightness I think some form of remote control is desirable. The glare from some white objects can be trying. On the other hand, some are not seen at their best unless brightness/contrast are turned up somewhat.

For the past three years I have used Bowden control, adapted by myself, for this purpose, with every satisfaction.

As to viewing distance, I think many viewers sit too far away from the screen, and consequently strain their eyes in trying to see the detail of the picture.

In my own case I find that from five to five and a-half times the width of the screen the most suitable distance.

Mr. Stoneley's suggestion that we view through a green-tinted screen fills me with dismay. Fancy viewing our charming girl announcers through that ghastly tint! Or a lovely old sunlit country house! To say nothing of the debonair McDonald Hobley with a green complexion!—O. DAVIES (S.E.12).

### TV AERIALS

SIR,—I have been extremely interested in the letters which have appeared in your valuable paper, and have wondered whether some of the fantastic arrays are really necessary, especially in view of the letter from "Dealer," Bristol.

After much experimenting I have proved that multi-rods, or, indeed, rods at all, are unnecessary, and have, therefore, abandoned their use together with masts, bands, etc., and also the terms "forward gain," "db gain," etc., in favour of the expression "pick-up."

My theory and experience shows that, with certain limitations, it is merely a question of presenting sufficient metallic surface to the TV station. The "slot" aerial proves this.

I use a cylinder type aerial and get such surprising results that I have protected it in both vertical and horizontal form.

I know there will be opposition to my views, but a little theory combined with a lot of practice will once again confound the theorists.—J. W. HOBLEY (G2VU) (Wellingborough).

### REFILLING MAGNIFIERS

SIR,—I have just read Mr. Charles Hassell's letter in PRACTICAL TELEVISION relating his experiences in refilling his 9in. magnifier.

I, too, had a similar experience recently which I thought may be of interest to your readers.

Having decided to change the liquid paraffin much against the wishes of the rest of the household, I first drained the old liquid out and carefully measured same before pouring it down the drain. I was very surprised to find so much in what appeared such a small space—six and a half pints in all and not ounces, which is obviously a misprint in Mr. Hassell's letter.

Having obtained two Winchesters from a chemist friend I bought seven pints to allow for possible wastage which I could foresee possible in filling through the small ¼in. hole.

Before filling I thoroughly washed the magnifier with warm water and a detergent which does not froth up too much when mixed. Having accomplished the washing to my satisfaction, I then had the trouble of drying out, but this proved fairly easy by warming the outside in hot water, with the hole uppermost; it soon evaporated.

Now came the refilling, which I commenced with some trepidation. However, all went well with the aid of a small plastic funnel and a small air vent filed in the spout. I timed the process, which took 23 minutes, and not a drop spilt.

Next, I replaced the screw together with a new washer, followed by a good polishing with metal polish. I refitted the magnifier to the set ready for the 8 o'clock Newsreel.

The results were astounding. A clear and brilliant picture almost like fitting a new tube, and apart from a few air bubbles which soon rose to the half-a-crown bubble at the top, operation "Liquid Paraffin" was highly successful.—B. C. POOLE (Rushden).

### YAGI AERIALS

SIR,—In the recent correspondence which has appeared in PRACTICAL TELEVISION on the subject of Yagi arrays, there has been one point raised which I would like to question. This is the reference to close-spaced arrays and the effects of windage and consequent flutter.

I presume that the term "close spaced" refers to aerials having the .15λ spacing between dipole and reflector.

To quote my own experience I set up an "H" array with this spacing last summer, and made particular observation for this trouble during the very high winds which we experienced last winter, and on no occasion was I able to observe any of the expected trouble.

This has prompted me to the thought that this question of wind flutter is largely academic or mathematical in its basis. This thought is given added support from the observation that the question generally seems to be mentioned when the writers, and there have been many, leave the practical path and start off into the theoretical undergrowth.

In short, my own experience plus enquiries from other .15λ spaced users suggests that this question of wind flutter is an over-rated bogey and unless some specific evidence can be offered to the contrary I suggest that it be forgotten.—I. D. MOTTRAM (Aylesbury).

### RE CAGE AERIALS

SIR,—I have no wish to continue this unhappy controversy. What began, for my part, as a light-hearted tussle with your contributor "Erg," has now deteriorated into mere verbal mud-slinging.

Naturally I accept, without any reservation, "Erg's" denial that the technical dissertation upon the bandwidth of television aerials contained in his reply to my first letter was culled from the Belling-Lee Bulletin, and I shall be most grateful if you will allow me space to make a full and unqualified withdrawal of my ill-founded accusation. I trust that "Erg" will accept this, together with my sincere apologies and regrets for any inconvenience to which he may have been put as a result. I cannot think that so well-known and veteran a writer can have suffered any actual damage to his deservedly high reputation from the ill-advised remarks of an unknown amateur such as myself.

I quite realise, upon reflection, that "Erg" would not have quoted from another publication without due acknowledgment, and the fact that there is such marked agreement between his statements and those in the Belling-Lee Bulletin is simply evidence of the accuracy of his technical knowledge. I was unfortunately misled by a purely fortuitous similarity of phrasing into assuming that the one was the source of the other.

I woud like to assure "Erg" that I had no desire whatsoever to discredit him personally. My sole purpose was the advancement of science in the cause of the amateur.—H. B. GREGORY (Birmingham).

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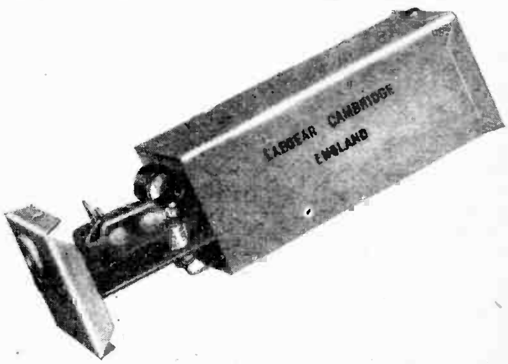


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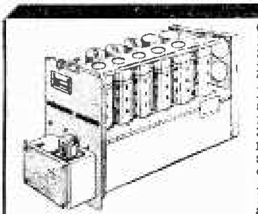

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## "VIEW MASTER" COILS

**I built the View Master about two years ago, and have noticed the insulation on some of my coils is very poor and decided to rewind them. I made a note of the number of turns, etc., but unfortunately I have mislaid same. Enclosed is stamped addressed envelope. I live in the Sutton Coldfield area.—F. Cadman (Nuneaton).**

Coil details for the Sutton Coldfield View Master are as follows :

| | | | |
|---|---|---|---|
| L101 | 1½t. | L108 | 12t. |
| L102 | 7½t. | L109 | 4½t. + 1½ coup. |
| L103 | 11½t. | L110 | 4½t. + 1½ coup. |
| L104 | 4½t. | L111 | 4½t. + ½ coup. |
| L105 | 13½t. | L112 | 3½t. + ½ coup. |
| L106 | 6½t. | L113 | 7½t. |
| L107 | 10½t. | L114 | 12½t. |
| | | L115 | 13½t. |

## E.H.T. FAILURE

**I have a "Premier Magnetic Televisor" which worked quite well when I was living in the London area. Since changing the coils so that it would operate on the Holme Moss frequency I haven't been able to get satisfactory results.**

**Although the frame timebase more than scans the face of the tube, I cannot get the correct width. There is about an inch and a half blank at each side. When I turn up the Brightness control it functions correctly so far, and then the tube goes blank. I have checked the control itself and it is quite all right. I have also checked all H.T. and L.T. voltages and they are all in order. I haven't got the necessary meter to check the E.H.T. The tube I am using is a Mullard MW 31/17.—P. Taylor (Nr. Carnforth).**

The fault seems to lie in the line output stage or the E.H.T. system ; when the width is advanced beyond a certain stage, the E.H.T. fails and the tube blanks out. The actual trouble may be due to almost any component associated with these circuits, and it will be necessary to check them all systematically. Poor E.H.T. regulation can be due to a failing rectifier(s), a leaking E.H.T. condenser, or an extremely high impedance in the E.H.T. network. Ensure that the H.T. rail feeding the line output stage is of correct voltage, and check on the line valve itself. Try the effect of putting a 500 pF mica condenser across the line scan coils.

## PULLING ON BLACKS

**I have a home-built televisor with a very aggravating fault. This consists of pulling on *blacks*. On the test pattern lines ending black are displaced to the right. The set is a T.R.F. lined up correctly.**

**I have experimented with the detector and video stages, e.g., reducing bias on video valve, with no result, yet turning up the contrast well beyond optimum gives perfect sync on black and white lines.**

**As regards the sync separator I can obtain perfect interlace and line hold. I have tried many circuits and tried varying the anode and S.G. voltages with no improvement. Perhaps you could indicate where the fault occurs as I have no C.R.O.—J. Hassitt (Liverpool, 20).**

The fault you mention is probably not so much a displacement of blacks to the right, but a delay in white lines in starting from the left. The trouble can be caused by excessive phase delay in the video amplifier, and the whole of this circuit should be checked. You state that you have tried many circuits, but you do not say whether this remark applies to the video stage or the sync separator. You should reduce the 47 k$\Omega$ grid resistance into the latter stage to 10 k$\Omega$ or, if line tearing is not apparent, cut it out altogether.

The receiver alignment should be rechecked carefully, as with a single-sideband receiver it is easily possible to have the response curve displaced in relation to the carrier.

## "COMPACT TELEVISION" COILS

**I have made the "Compact Televisor" as published in May and June, 1951, and I have used the Haynes type screened coil formers and wound my coils for No. 1 and No. 2 channels (Holme Moss). I should be obliged if you will inform me of alterations required for Pontop, which is about eight or nine miles distant. Also, if rejector coil or coils will he needed.**

**As there are so many different diameters of coil formers (¼in., ⅜in., ½in.), I think if a table was compiled and published it would be greatly appreciated. Not forgetting the sound I.F.'s and P.F.'s shunting these coils.—H. M. Robson (Newcastle-on-Tyne).**

The details are as follows :

L1—5 turns tapped at 1 turn.
L2—4 turns. 1½ turns at bottom of former.
L3, L4, L5—4 turns.
L6—3½ turns.
L7—Anode, 5 turns as at present.
Grid, 4 turns as at present.

Coils wound with same wire gauges, winding pitch, spacings, etc., as at present.

As regards rejector coils, this must be decided by trial. If rejectors are needed they should be wired in as shown in the article (page 52, PRACTICAL TELEVISION, July, 1951). They should be wound as L3, L4, L5 above.

Messrs. Haynes booklet, "Television Circuits," Technical Publication No. 38, 4th edition, contains very full winding data for Haynes formers.

## CHANNEL I RECEIVER FOR CHANNEL 5

**I wish to modify a London model T.R.F. television set for Wenvoe working. Can you recommend a good converter circuit for this purpose ? I have on hand a quantity of polystrene formers with slugs, ⅜in. diameter, and also some of 5/16in. diameter. Heater and H.T. current are not critical, neither the number of valves employed.**

**I have searched through all my numbers of "Practical Television" but cannot find the circuit I require.—Basil Smith (Weymouth).**

With slight coil modifications the converter described in December, 1951, issue of PRACTICAL TELEVISION should be suitable for this function. It is suggested that the coils be altered as follows: L1—4.5 turns close wound, tapped at 1.5 turns at the earthy end; L2—5 turns close wound; L3—8.5 turns close wound, tapped at 1.5 turns at the earthy end. L4 and L5 should be wound as per the article, for the alteration in oscillator frequency can be catered for by adjusting the spacing between the windings on the oscillator coils.

## FLARING ?

**May I once again enlist your help in locating a fault in my View Master. The position is this: the picture was good with good definition, and then developed a slight flare on the right of all images, this being most noticeable on white objects or backgrounds. This flaring has got steadily worse and is now accompanied by valves 3 and 5 together with R22 becoming hot. Line sync also tends to slip momentarily in the top left corner of the picture, but readjustment of the line hold rectifies this. Finally, it has reached the stage where the black cross tuning signal appears with the top half of the cross being in the normal position, while the bottom half is doubled, one each side of the top half thus, and the whole raster is covered by a very fine check pattern.—L. Nicholas (Sheffield 4).**

We cannot quite understand your reference to "flaring," since this effect is usual with poor regulation of the E.H.T. supply, and we are wondering whether this is the fault in your case or whether it is due to an alignment fault in the vision receiver which is gradually becoming worse. Valves 3 and 5 and R22 will normally run hot and no harm should occur. It is also possible that R21 has been changing in value, causing difficulty with the line hold. The "check pattern" which you mention may be due to instability in the V6 stage and we suggest that this stage be examined carefully, if necessary the metal screen of the EF50 being earthed separately above the chassis.

## LINEARITY PROBLEM

**I have very recently rebuilt the line section of my 12in. TV set, using a Haynes T.34 transformer—skeleton circuit on a separate sheet. This transformer is for either 50 deg. or 70 deg. tubes, and is being used with a Mullard MW31—17C, 12in. tube. I find it difficult to attain *perfect* linearity without too low an E.H.T. I can get an absolutely linear picture with R10 about 2 KΩ, but only about 6 Kv., whereas I wish to apply 9 Kv., at which voltage the right side of the picture (as seen by the viewer) is slightly compressed.**

**I feel there must be some component which adjusts the relationship width of scan and E.H.T., and your advice would be very much appreciated.**

**Incidentally I tried the 1½ times multiplier circuit in a recent PRACTICAL TELEVISION, but found it impossible to get a small enough scan with 9 Kv., and had to employ full voltage doubling, with a resistor between cathode and R5, to get a reasonable picture.—F. B. Dewhurst (Forest Hill).**

Try a variable resistance (up to 10 KΩ) in series with the 800 pF. charging condenser in your line circuit; try also the following: remove the 82 ohms cathode resistance, reduce the H.T. rail to about a 350 volt level, and remove the cathode by-pass condenser. The linearity control across the line coils should not normally be necessary, the simple condenser being sufficient to reduce the E.H.T. to the required value. For 9 Kv. a value of about 300 pF. is required. It is assumed that the scanning coils are matched to the T34 transformer.

## LINE TIMEBASE DEFECTIVE

**I have a TV set of well-known make, picture size 9in. At the top of the picture there are a few white lines..**

**The set may work well for a fair period, then the picture vanishes for a second or two, showing a jumble. Then the picture will reappear. There is also a picture flutter, not bad, but noticeable. Could you please suggest possible causes and cure.—K. Sharp (Mansfield).**

A fault similar to that described has been known to occur in sympathy with an intermittent defect in the reclaim section of a receiver, and in this case the reclaim diode itself was proved to be responsible. It is possible, however, that a similar symptom would result should a fault occur anywhere in the line time-base section, and for this reason the entire circuit should be carefully examined, paying particular attention to the valves which are directly associated with the line timebase/E.H.T. portion of the circuit.

## SUBSTITUTING LINE OUTPUT VALVE

**Could you please furnish me with the following information? In the View Master, can a KT66 be used in place of V10? Also what voltage is there on V10 anode, as the book merely states, "Do not touch"? —R. Haygarth (Hebburn-on-Tyne).**

Though it may be possible to use a KT66 in place of the specified 6P28, we doubt very much whether it would be satisfactory because of the very high peak voltage occurring at the anode which makes it necessary to use a valve having a top cap anode connection. It is probable that if the KT66 was used there would be a breakdown between the anode pin and the adjacent connections. It is impossible to measure the D.C. volts at the anode of V10 as there is a peak pulse of around 3,500 volts.

## "PROTECTING YOUR RECEIVER"

**I am very interested in the article in May issue, page 449, on "Protecting Your Receiver." My set is cathode modulated. On page 550, Fig. 2, from one side of relay, arrow points "To Bleeder Chain." I should like to know to what part, "hot end" or "earthy end"; also, is there another resistor wired in, as shown in Fig. 1?—F. Stone (Erith).**

The connection "to bleeder chain"—Fig. 2, in "Protecting Your Receiver"—should be arranged as shown in the circuit of Fig. 1, that is to the "hot" end of the *additional* resistor.

## MIXING CIRCUITS

**I am anxious to use a View Master sound/vision chassis with the P.T. Argus time bases, etc. Could you please pass on any information if this is a good practical idea?**

**I did intend to bias the video amp. as per the details in the December issue of P.T., by G. T. Layton, but would it be in order for me to reverse the diode detector connections so as to provide correct output at the anode of the video amp.?—H. David (Chester).**

We would on no account recommend the indiscriminate mixing of circuits as this is bound to cause difficulty. If, however, you particularly wish to use the V.M. vision chassis then we suggest that the diode and output stage be modified to conform with the Argus.

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# News from the Trade

## New Marconiphone 15in. Television Receiver

MODEL VC60DA recently introduced is a five channel console receiver with a 15in. aluminised Emiscope tube.

Pictures are bright enough for daylight viewing, sharply focused and of the best photographic quality, with natural tone gradations.

Picture area is approximately 120 square inches.

Due to the advanced nature of the circuitry, plus a special interlace filter, definition is at least 2.5 Mc/s. measured at the tube face.

Interference suppression, on both sound and vision, is particularly effective, and there is an additional circuit to deal with aeroplane flutter.

The 10½in. elliptical loudspeaker provides sound reproduction fully in accord with the high quality of picture reproduction given by the Emiscope screen.

Model VC60DA is housed in a handsome walnut finish cabinet with doors to cover the screen when not in use. The price is £69 13s. 5d. plus £23 15s. 7d. P.T.—The Marconiphone Co., Ltd., Hayes, Middlesex.

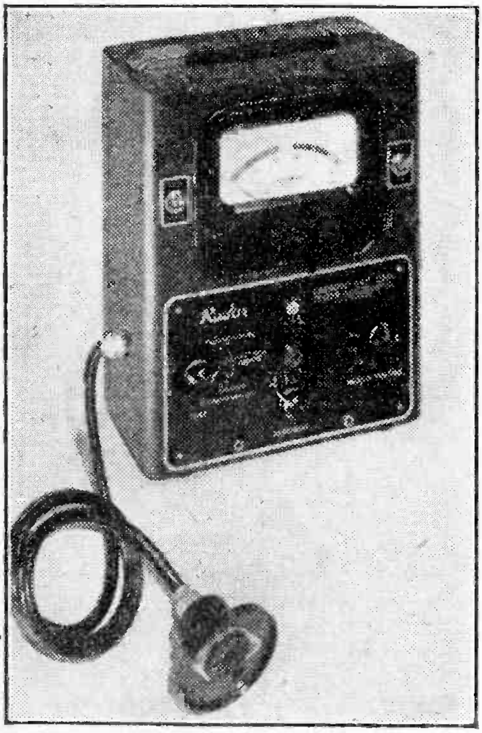
## An Improved 17in. Rectangular Television Tube

MULLARD, LTD., have recently made an addition to their range of Long-Life Television Picture Tubes. It is the MW43-64, an all-glass rectangular tube with a 17in. diagonal grey glass face.

A feature of this new tube is the incorporation of a new form of electron gun which is designed to give uniform focus over the whole screen. In this new gun assembly the functions of electron acceleration and pre-focusing, which have hitherto been combined by the first anode, have been separated by the inclusion of an additional electrode.

The first anode in the MW43-64 acts as an accelerator, having a potential of 200 to 410 volts with respect to the cathode. The second anode exerts a pre-focusing action on the electron beam, thus influencing the spot size and uniformity of focus. When the potential on this anode is zero or negative with respect to the cathode, the spot size at the centre of the screen and the width of the unfocused beam are such that optimum uniformity of focus is obtained over the whole picture area.

Further technical details of the MW43-64 can be obtained on application to the Technical Service Department, Mullard, Ltd.—Century House, Shaftesbury Avenue, London, W.C.2.



The radar picture tube tester and reactivator.

## Radar Tube Tester and Reactivator

THE illustration shows the Radar Tube Tester-Reactivator, which is designed, as its name indicates, for not only testing picture tubes, but also for imparting to some of them a new span of life. A series of plugs and leads is provided which plug into the Unit and then at the other end clip on to the tube to be tested, without removal from the set. Simply take off the tube socket or base and push on in its place a suitable socket from the range supplied. The other end goes into a special socket on the tester, and the mains lead of the tester is then inserted in a socket and switched on. The large dial indicates whether the emission is satisfactory, any heater-cathode leakage, inter-electrode insulation and, of course, filament or heater continuity. A further socket on the instrument enables it to be used as an ohmmeter with a range up to 50 megohms. If a tube is found to be faulty due to having been under-run or through long stocking, the knob controlling the heater voltage may be turned up in steps, whilst watching the indicator, and in many cases this over-running of the heater results in a new surface being provided on the cathode, in the manner already familiar to most servicemen. The instrument is fairly robust and contains only one valve—an EA50, so that replacement costs are reduced to a minimum. A booklet supplied with the instrument gives a list of tubes and the appropriate base. We have tested the instrument on a number of tubes and have found it extremely useful. Spare sockets are available at 10s. each. The Tester is priced at £21.—Waveforms, Ltd., Radar Works, Truro Road, London, N.22.

**QUERIES COUPON**

This Coupon is available until June 21st, 1953 and must accompany all Queries.

PRACTICAL TELEVISION, June, 1953.

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