AN IMPROVED SLOT AERIAL

PRACTICAL TELEVISION

AND TELEVISION TIMES

1/-

EDITOR F. J. CAMM

A NEWNES PUBLICATION

Vol. 4 No. 43 DECEMBER, 1953

FEATURED IN THIS ISSUE

Flyback Suppression
Fault Symptoms
TV in 3-D
The Beginner's Timebase
Black is White
TV for the Beginner

PRACTICAL TELEVISION
& "TELEVISION TIMES"

Editor : F. J. CAMM

Editorial and Advertisement Offices: "Practical Television," George Newnes, Ltd., Tower House, Southampton Street, Strand, W.C.2. 'Phone: Temple Bar 4363. Telegrams: Newnes, Rand, London.
Registered at the G.P.O. for transmission by Canadian Magazine Post.

Vol. 4 No. 43 EVERY MONTH DECEMBER, 1953

TELEVIEWS

Colour TV in America

ACCORDING to reports a highly successful colour TV system has passed most rigid tests in America and it is announced that colour TV programmes will be regularly radiated in that country in the very near future. By means of an adaptor any TV receiver capable of receiving pictures in monochrome will be able to receive pictures in colour. Receivers not so adapted will be able to receive the colour pictures in the usual black and white or sepia. It will be remembered that colour TV programmes were regularly radiated for a short time in the U.S.A. but for various reasons they were dropped, the most important reason being the poor quality.

The new system is based upon transmission standards for full colour TV laid down by a committee of engineers and physicists specially appointed for the purpose. Known as the National Television System Committee they have evolved a "fully compatible" TV signal which can be radiated within the present American 6 Mc/s channel making use of their standard 525 line and 60 frames with 30 interlaced pictures per second.

Briefly, the colour is added to the present black and white signal by means of a sub-carrier which is spaced 3.5 Mc/s from the black and white signal carrier and occupies a band of 1.7 Mc/s.

Although we are told that we could have colour TV in this country at the present time, economic difficulties will not permit it. It is, therefore, not possible to compare the American system with our own, nor to say with certitude whether the American system is superior. It is quite certain, however, that colour TV is, in the ultimate, inevitable. Most of the involved technical problems have been solved. Whether this American announcement will cause the BBC over here to change its plans remains to be seen.

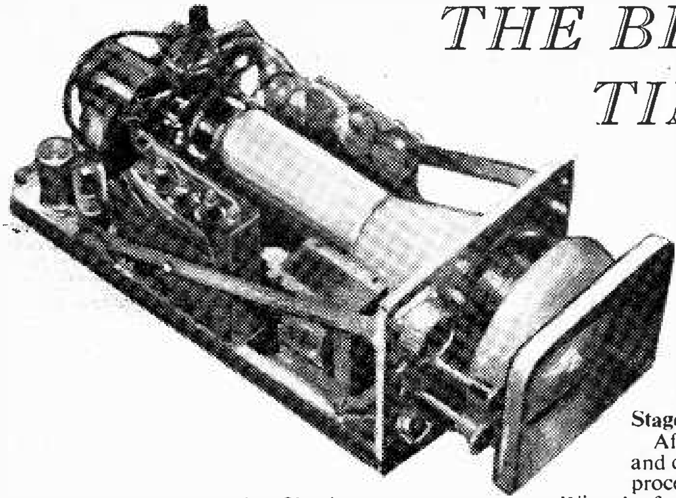
The Editor and Staff Join in Wishing Every Reader a Very Happy Xmas

Sponsored Programmes

A SPEAKER in the course of a recent debate on the subject of sponsored TV, and the special problems connected with it, explained how it would operate. The problems are, of course, complex and not altogether concerned with ethics. Some of the opposition is based on fear. The lecturer, however, devoted a considerable amount of time on what would and would not be permitted in such programmes and seemed unmindful of the fact that if commercial interests are to pay large fees for programme time they will expect at least to get their money back. This they cannot do if the only acknowledgement they receive on the screen is that the programme is being transmitted by the proprietors of So-and-So's Soap. The advertiser is going to have a considerable amount to say about what he expects and, indeed, will demand, for his money and whoever operates the first commercial TV station may find himself with considerable blanks in programme time if he adopts a dictatorial attitude. It is not generally known that in the early days of radio in this country sponsored programmes were tried but failed because of the very tardy acknowledgement sponsors received.

The general impression seems to be that the proposed commercial stations will act as dictators with a never-ending queue of advertisers anxious to put a programme on without caring very much what they get in return. The BBC is not a commercial organisation ; private businesses are.—F. J. C.

THE BEGINNER'S TIMEBASE—4



DETAILS OF THE CONSTRUCTION OF AN INEXPENSIVE UNIT FOR ELECTROSTATIC TUBES

By B. L. Morley

(*Continued from page 265 Nov. issue*)

Stage VI.—Testing the Line Circuit

BEFORE making an actual test on the line circuit it is advisable to check on the C.R.T. to ensure that nothing has been displaced in that circuit. Insert the C.R.T. and V8 and switch on. The spot should be received as before and the focus, brilliance, shift horizontal, and shift vertical controls should function on the spot as before.

Switch off.

Temporarily disconnect tie connections on C25; connect a 6 v. flashlamp bulb across the heater of any valve in the circuit (excepting, of course, the rectifiers) and insert V9 in its holder.

Now switch on. The 6 v. bulb and the heater of the rectifier should glow. If the bulb "blows," then a connection exists between H.T. and the heater circuits at some point; the fault should be cleared before proceeding further.

Assuming that all is in order then disconnect the bulb and switch off. Now insert V4 and V5 in their holders and reconnect C25.

After waiting two minutes then switch on and observe the screen.

When the set has warmed up two things should be observed; the first is a high-pitched whistle, and the second is a line on the screen. If the high-pitched whistle is not heard, operate VR3 throughout its travel and at some point the whistle will be heard. If no line appears on the screen, turn up the brilliance control until it does. If the spot only appears it indicates the oscillator is not working and the cause must be investigated.

At this stage it will be found that VR2 and VR4 affect the width of the line and operation of these two will increase or decrease its length and also cause non-linearity of scan, evidenced by the line being rather brighter on one side of the tube than the other.

The line (which will be horizontal, of course) can be made to move up or down or sideways with the operation of the shift controls. The focus control will make it a thick line or a thin line and the brilliance control should fade it right out. The line hold control has little effect at this stage other than to change the pitch of the whistle or to alter the width of the line.

Any faults which are apparent should be cleared at this stage. Work can then proceed to Stage VII.

Stage VII.—The Frame Circuit

After removing the C.R.T. and all valves and disconnecting the mains lead wiring can proceed in accordance with Fig. 10.

Wire the frame amplifier first.

C18 is positioned on the chassis adjacent to the valveholder. The connection to C11 is taken through the chassis to the condensers on the top panel.

R22 is kept in position by the wiring but R25, 26, 23, 17, 18, 19, 20, 21, C14, 15 are on the main resistance panel. R18 and R17 can be a single resistance if desired and the same applies to R20 and R21.

C13 is mounted under the cross member of the chassis at the end of the resistance panel, and is kept in position with adhesive tape. The wiring will keep it in position when the wiring is completed.

VR5 is the big variable resistor recovered previously. R40 is connected between this control and the H.T. +ve on VR4.

When the wiring has been completed it should be checked thoroughly in accordance with Fig. 10. Tests can now be made.

Stage VIII.—Testing Frame Circuit

Insert the C.R.T. and V8 and check for the spot as in Stage V to ensure the wiring has not been disturbed. Switch off and insert V9, V6 and V7.

Switch on after two minutes.

A vertical line should be received on the C.R.T. If it does not appear, turn up the brilliance control. If only a spot appears, it indicates that the frame circuit is not working and a check must be made for the fault.

The operation of the various controls should now be checked. The brilliance control should fade out the line; the focus control should make it very broad or very thin; the shift controls should make it shift up or down and left or right; the height control should make it tall or short. The frame hold control will have little effect at this stage.

There is one important point to note at this stage; it is that it may not be possible to get the line fully to scan the tube. It will probably be found that the overall length of the line is little more than 4in. from top to bottom and appears to fade out at both ends. This is due to cut-off in the tube and nothing can be done to rectify it. However, providing the line is 4in. long, there is no need to worry as this is the actual height of the masks supplied for use with the VCR97 and will provide a picture of the correct proportions accompanied by full horizontal scan.

It is advisable to obtain a tube which is guaranteed full picture, i.e., that the Y plates will allow a deflection of at least 4in. and the X plates allow deflection across the full width of the tube.

It is now possible to check the complete raster.

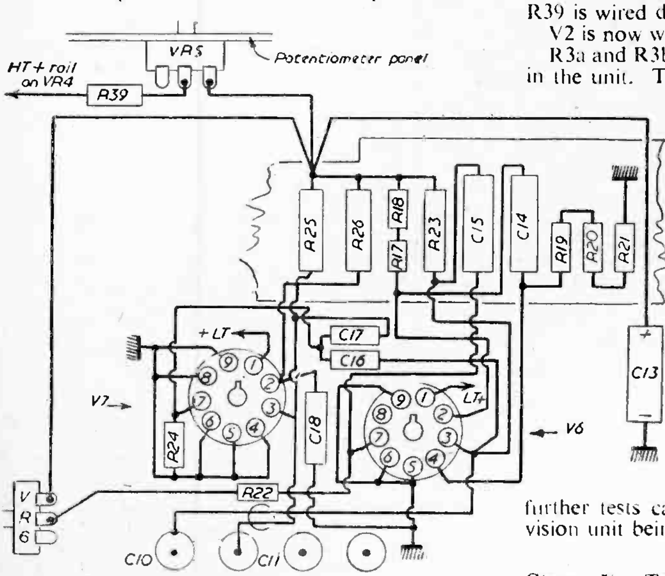


Fig. 10.—The frame circuit.

Switch off and let the circuit cool down for two minutes; the procedure prevents any surges from causing damage; it is unwise to switch on again immediately after switching off.

Insert V4 and V5 in addition to the valves already in the circuit.

Switch on.

This time a complete raster (an oblong pattern) should appear on the screen. The various controls should function as before but this time it will be noted that the frame hold will alter the distance between the lines; the line hold will also alter the lines. The height control does not have a very great effect where tube cut-off exists.

At this stage the tube holder can be rotated so that the raster is in the correct plane.

If all is in order proceed to Stage IX.

Stage IX.—The Sync Separator and Phase Splitter

All valves must be removed to prevent damage (not forgetting the C.R.T.).

Wire up the sync separator circuit first.

C3 is mounted directly on the chassis. R5, 6 are mounted on the main tag strip. C2 is fitted between C13 and R5 and is kept in position by wiring. R7 and C2 are mounted in the position shown.

VR1 controls the operating point of the sync separator. The earthy side is taken to a bolt in the potentiometer panel; the centre tag is taken to pin 2 of V3. R4 is wired directly between the outer tag of VR1 and H.T.+ on VR4. C22 is mounted on the chassis by using a clip recovered previously. R39 is wired directly across the valveholder.

V2 is now wired.

R3a and R3b are used in parallel as they are surplus in the unit. They can be substituted with a 10 KΩ resistor if desired. R2 is wired directly on the main tag strip in the position shown. R1 is wired directly across the valveholder.

V1 is mounted at the back of the front panel and the anode is earthed under the bolt fixing the valve-holder to the chassis. The cathode is wired to C1.

C1 is wired directly on the Pye socket on the front panel and coaxial cable is run from this point to the grid of V2. The outer braiding of the coaxial is earthed on the same lug which held the coaxial previously wired to the Pye socket.

Having completed the wiring in accordance with Fig. 11, the circuit should be completely checked. No further tests can be made at this stage without the vision unit being attached.

Stage X.—Testing Sync Separator and Phase Splitter

All valves should be inserted in the timebase and the unit switched on. The results should be as in the tests after Stage VIII and a raster suitably proportioned

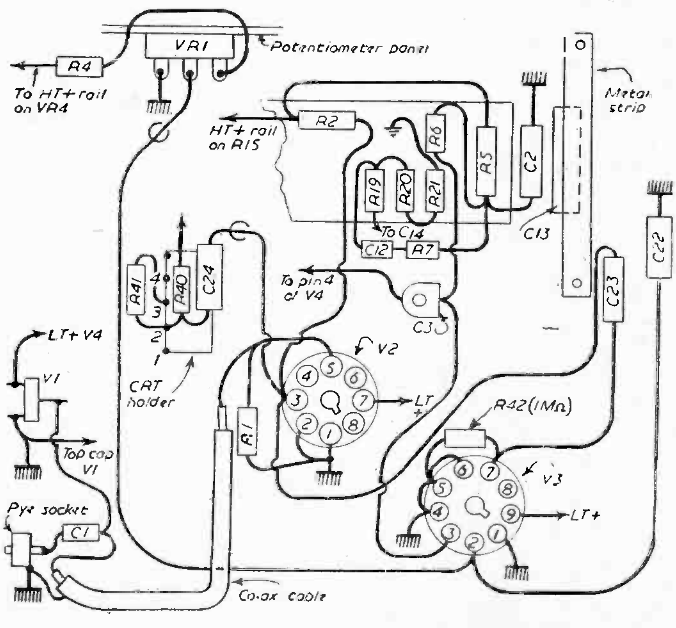


Fig. 11.—Sync separator and phase splitter.

should be obtained.

The vision receiver (which should have been checked for results previously) should be switched on. When tuned in, a loudspeaker with a condenser in series with one of the leads should be connected across the output of the vision receiver and it should be verified that a strong vision signal is being received.

Now connect the output of the vision receiver to the input of the timebase with the brilliance control adjusted so that the raster is just visible and the focus control adjusted so that the lines are finely focused.

The connection of the vision input should cause a pattern to appear on the screen ; operation of the line hold control should resolve this pattern into a picture and operation of the frame hold control should stop the picture from slipping up or down.

If two or more pictures are received one on top of the other, then the frame circuit is not oscillating at its correct frequency and must be checked ; similarly if two or more pictures appear side by side, then the line hold control should be further rotated to endeavour to resolve one complete picture, but if no setting of the control will resolve one complete picture then the line circuit must be checked.

Should it be found that the picture will not lock into position then VR1 should be adjusted ; the best operating position will be found somewhere at the midway point, but if no setting of this control will cause the picture to hold, then the sync separator must be inspected.

Failure to produce a picture when a strong input signal is applied usually means trouble in the phase-splitter circuit and this part should be inspected.

Conclusion

If the instructions have been followed faithfully there should be no difficulty in getting the unit working ; if snags do occur they should be fairly easy to localise—the method of construction employed should at least teach the beginner a great deal about the function of the parts of the timebase.

Voltage Readings.

(Note these readings have been taken with an inexpensive meter such as is used by the average constructor. Different types of meters will give different readings but they should approximate to those given here.)

H.T. +ve rail 405 v.
V2.—Anode 395.
V3.—Anode 315 Screen 45.
V4.—Anode 180 Screen 390.
V5.—Anode 1, 165. Anode 2, 180.
V6.—Anode 140 Screen 205.
V7.—Anode 60 Screen 120.

Crystal Palace TV Station

As already announced, the BBC is to build a new London television transmitting station on the Crystal Palace site in South London. Contracts have now been placed with Marconi's Wireless Telegraph Company Limited for two vision transmitters of 15 kW each and two sound transmitters of 4.5 kW each for the new station. The two vision transmitters will be operated together, thus ensuring greater reliability, because if a fault should develop on one the service can be maintained on the other without interruption. By the use of a high-gain aerial system, the station will be capable of producing an effective radiated power (E.R.P.) of approximately 250 kW. This compares with an E.R.P. of 100 kW for each of the four post-war high-power stations and 34 kW for Alexandra Palace. The sound transmitters will also be operated together.

The Crystal Palace station is being designed so as to make it possible to raise the power still further should this be required at a later stage.

The Aerials

The aerial system will be erected at the top of a self-supporting steel mast 640 ft. high which will raise the aerial to a height of approximately 1,000ft. above sea level. The higher power of this station will not greatly increase the area already served by Alexandra Palace, but it will give a much stronger and therefore more interference-free signal in those parts of London and the suburbs where the level of interference is high. In particular, it will greatly improve the service along the south coast, at present a fringe area where reception generally speaking is unreliable.

Transmissions from the new station will be vertically polarised and on the same frequencies as those used at Alexandra Palace, namely, 45 Mc/s for vision and 41.5 Mc/s for sound. Viewers will not, therefore, need to change their aerials, but directional aerials (such as the H and X types) may need to be turned round to give the best result. The new station will take about two years to build.

The Transmitters

Crystal Palace will have two 15 kilowatt vision transmitters designed for parallel operation with a combined output of 30 kilowatts. The effective radiated power of this station is expected to be between 200 and 250 kilowatts, which is twice that obtained from any of the existing regional transmitters. In order to achieve this the BBC will, for the first time, use a high-gain aerial system, thereby utilising a transmitter output power which is only 60 per cent. of the regional transmitters.

The vision transmitters are a new design built around a new type of tetrode valve being manufactured for Marconi's by their associate the English Electric Valve Co. Ltd., which simplifies the design and in consequence considerably reduces the physical size. They will occupy only about a quarter of the floor space of those at Alexandra Palace and Holme Moss, and about half the floor space of those at Kirk O' Shotts and Wenvoe.

The necessary adjustments to the transmitter are effected from the adjoining control room. This room will be equipped with a special control desk incorporating controls for starting and stopping both vision and sound transmitters. The transmitter drive, input and monitoring equipment will be mounted in the same room.

These transmitters are part of the latest range designed by Marconi's for the export market and can be used on either British, American or other standards. The two 4½ kilowatt sound transmitters which will also operate in parallel are being designed specially to meet the BBC's requirements, since they employ amplitude modulation.

BLACK *is* WHITE

AN EXPLANATION OF THE DIFFERENCE BETWEEN THE BRITISH AND AMERICAN TELEVISION MODULATION METHODS

By S. C. Murison

IN conversations with various constructors recently the writer has heard views expressed which tend to show that the relative merits of the British and American modulation methods are not understood too well. The following brief notes are concerned only with the polarity of the video signal, that is, with the difference between making peak white either maximum or minimum carrier power. The American synchronising practice of sending a group of half-line duration pulses *before and after* the frame synchronising pulse is not considered. Taking only the video signal, two points are worthy of comparison. First, that of preserving tonal gradation, and, second, that of minimising the effects of interference.

The easiest way to preserve tonal gradation (that is, a smooth change from black to white or vice versa) is to ensure that as the video waveform from the camera changes its amplitude the transmitter changes its power in the same proportion. For this to be so, the modulator and transmitter valves must be working on straight parts of their Ia/Eg curves. The straight parts of these curves are away from current cut-off (Fig. 1). Unless synchronising pulses are to be sent beyond white (which so complicates the receiver that no practical system has used the method), this means that black should be at the start of the straight part of the Ia/Eg curve with peak white at the top of the straight part. Fig. 1(a) shows this happening for the British system. As an easy example, video is shown as one line of sawtooth form, that is, the picture on the screen would change smoothly from black at the left to peak white at the right. It is clear from Fig. 1(a) that if any part of the waveform suffers because of the bottom bend in the valve's curve it is black or near black. As black or near black is less visible than other parts of the picture this is no real disadvantage.

Fig. 1(b) shows the same waveform as it is applied in the American method of modulation. In this instance, white or near whites are subject to degradation due to the bottom bend in the valve's curve.

Not only is the transmitter concerned in such effects. The detector in the receiver—regardless of its type—introduces a similar effect. With the British system this results in the proportion of synchronising pulses fed out of the detector being reduced, the effect often being called "sync. crushing". If the British receiver has adequate band width before the detector the synchronising pulses will have steep sides and crushing will not affect the timing of the raster. Thus no ill effects arise providing a sufficient amplitude remains for the sync. separator to work from. Curvature in the R.F. voltage applied versus video voltage out response of the detector in an American receiver results in degradation of the near white and white components of the picture.

Interference

Coming now to the second point of interest: The British waveform results in interference always being towards white (or beyond it), that is, interference is always away from the amplitude corresponding to synchronising pulses. This means that the picture usually remains locked during interference but is seen through a "snow storm." On the other hand, the American waveform results in interference being towards black—or beyond it. Consequently, interference can reach the synchronising circuits and may unlock the timebases. A picture which remains a picture can be viewed through very great interference with some enjoyment of the programme, but a picture which breaks up cannot.

What is the cure for interference in each system? For the British system a limiter set to clip all levels above peak white is a simple (and common) method. This approach is moderately successful but tends to destroy tonal gradation near white. The so-called "black spotter" is a more effective device. A black spotter circuit is one which turns the cathode ray tube to black in response to a signal beyond white. With it in use interference appears as a series of pin holes.

For the American system what is needed is some scheme to keep the timebases going at the correct frequency in the face of interference. If this is done, the picture takes care of itself and suffers only from small black pin holes. But to do this means some form of "flywheel" synchronising and that means extra valves.

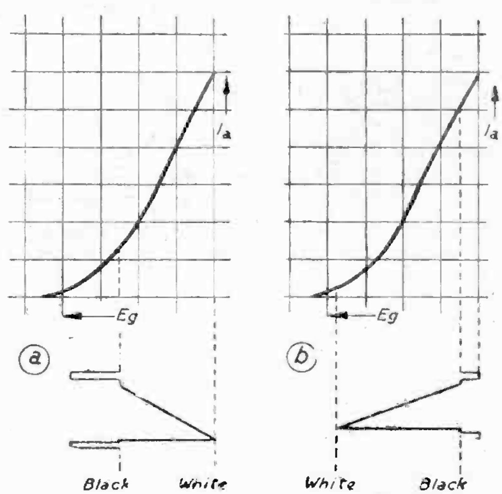
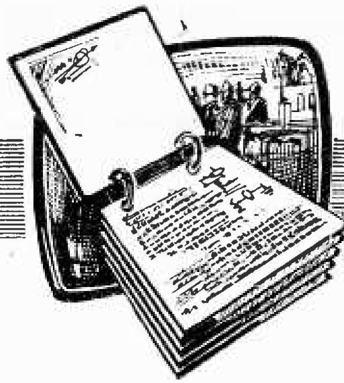


Fig. 1.—This illustration shows the picture content relative to the straight part of the valve curve.



Pages from a TELEVISION ENGINEERS Notebook

11.—AUTOMATIC SYNC CONTROL

AUTOMATIC synchronisation is used on receivers to overcome the effect of interference impulses and a weak video signal on the firing of the line time-base ; when these factors occur, singly or together, the firing becomes erratic, and consequently the edges of objects in the picture are extremely ragged and unstable.

Basically, frequency-control systems consist of methods of integrating a block of ordinary synchronising pulses to provide a control element, rather than allowing the direct sync pulses to control each scanning line individually. Three systems are fairly common, these being the sawtooth, the pulse-time and the sine forms ; we shall discuss these methods briefly in turn.

The Sawtooth System

Fig. 1 shows the basic layout of this particular form of control. The sync pulses are taken from V_1 and are of negative phase, being of the form therefore most generally found at the anode of a simple clipper-separator following a cathode-modulated tube input. Instead of being applied directly to the control electrode of the line oscillator, however, the pulses are passed to a phase detector system consisting of a pair of diodes V_2 and V_3 through a pulse transformer which eliminates the frame pulses in the process. The sync polarities at the ends of the transformer secondary are such that the diodes conduct, and capacitors C_a and C_b are charged to a level which biased these valves to cut-off except in the presence of the pulses. It is seen from an inspection of the circuit that the diodes form a bridge having a voltage from the anode of V_2 to the cathode of V_3 but no voltage across the opposite electrodes to these, these being strapped together.

A sawtooth voltage wave, obtained from the line output transformer is now applied to the centre-tap of the pulse transformer, the amplitude of this wave being adjusted until it is less than the voltage developed across C_a and C_b by the sync pulses, and so being incapable of setting the diodes into conduction by itself. When, however, the diodes conduct in the presence of the sync pulses, the sawtooth wave is momentarily connected to C_1, and with normal adjustment the sync pulse can be made to occur on the a.c. axis of the sawtooth ; see Fig. 2(a). Under this condition no charge will be acquired by C_1, but if the phase of the sawtooth shifts sufficiently so that the sync pulse occurs at a point such as shown at (b), the capacitor C_1 will acquire a positive charge equivalent to the voltage present at the point on the sawtooth, which is positive with respect to the a.c. axis. The grid of valve V_4 which is connected to C_1 consequently runs positive and the anode potential falls correspondingly. This negative drop is passed to the line oscillator, shown here as a blocking oscillator, and changes the phase of the oscillation in such a way that the sync pulse is returned to the original (centre) position on the sawtooth waveform.

If the phase of the sawtooth changes so that the sync pulse falls on the negative side of the a.c. axis, condenser C_1 acquires a negative charge, and this time the anode potential of V_4 rises. The frequency

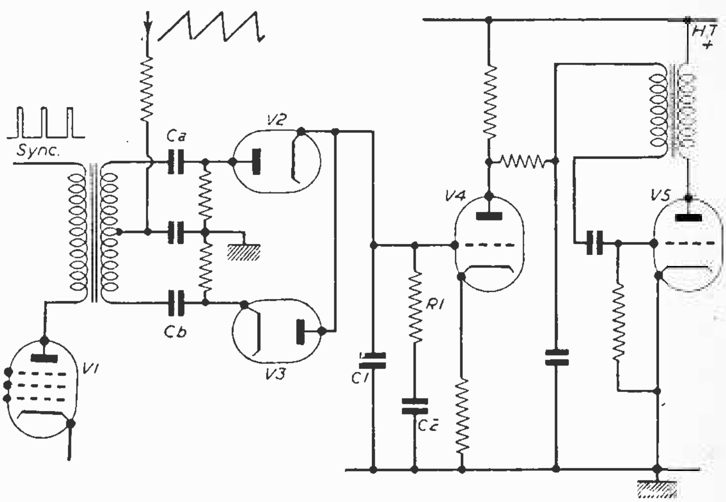


Fig. 1.—Basic circuit arrangement for auto sync control.

and phase of the blocking oscillator is thus held in step by the integration of the sync pulses. It makes no difference whether the rate of the sync pulse changes or the oscillator itself changes ; the action outlined above is the same. There is no D.C. return for the grid of V_1, and its potential can only change through the diode V_3. Important design components are C_1 and R_1 C_2. The circuit has a slight disadvantage in that the control is not instantaneous, and a small time lag occurs before control becomes effective.

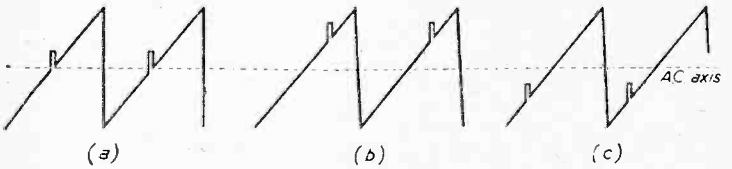


Fig. 2.—Position of sync pulse on the sawtooth waveform.

The Time-pulse System

This system enjoys the advantage of using the fewest number of valves, and also locks into synchronism the instant the signal is applied to it. A basic diagram of the method is given in Fig. 3, and its operation is based on width modulation of the sync pulse. It is in this idea that the pulse-time system differs from all other automatic circuits. A sawtooth wave, generated in the receiver itself is phased to permit a varying portion of the sync pulse to drop atop the positive peak of the sawtooth, while the remainder occupies the period of flyback. The control voltage is a function of the pulse *width* at the peak of the sawtooth. Proper operation depends almost entirely upon the waveshape which is applied to the grid of the controlling valve.

Referring back to Fig. 3, consider the network made up of C, C_1, C_2, R and R_1. A positive-going sync pulse applied to C will appear across C_2 attenuated as the figure insets show ; similarly, the negative pulses obtained from the line output stage and fed into RC_1 will appear across C_2 as a sawtooth wave with a large negative overshoot. A third waveform is obtained from the normal line oscillator charging circuit (a sawtooth) and is applied to R_1, where integration with C_2 produces the parabolic form shown in the appropriate inset. The combination of these wave shapes across C_2 depends for its final configuration upon the condition of phase between the local oscillator and the actual sync signal, and Fig. 4 shows the three possible states. At (a), most of the sync pulse occupies the peak of the parabola, while at (b) most of the sync pulse occupies the region of slope. At (c), exactly one-half of the sync pulse drops at the top of the parabola.

Now the control valve V_1 is biased near to cut-off by the D.C. component of the oscillator (V2) grid voltage fed through R_2R_3. The anode current of this valve is made up of pulses whose width is determined by the relative position of the sync pulses at the top of the parabolic wave ; the voltage developed across R_4 by this average anode current is fed from the cathode circuit of V_1 to the oscillator grid through R_5, and so maintains the phase of the oscillator with respect to the sync signals within very close limits.

It is an essential part of this kind of circuit that the output pulses from the sync separator should be of a constant amplitude.

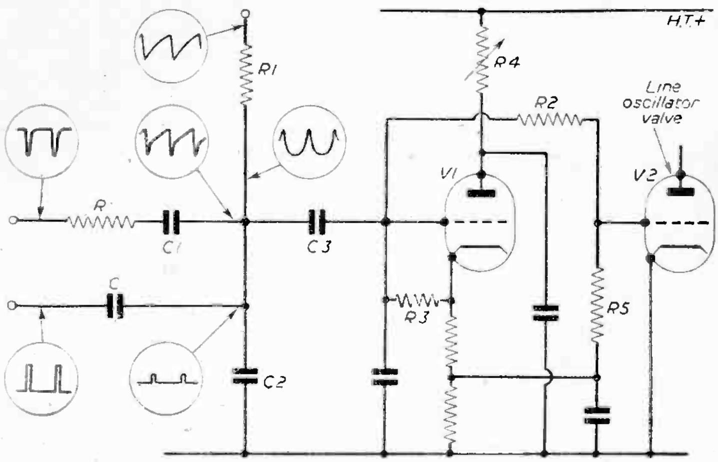


Fig. 3.—Basic circuit for the time-pulse system.

The Sine System

The sine system of control locks in synchronism as soon as a signal is applied, and of the three systems being discussed is most immune from the effects of a noisy signal. Its current consumption, however, is greater than either of the other methods, but this is a minor disadvantage.

Fig. 5 shows the basic circuit, together with the waveforms of importance. V_3 is a stable C.W. oscillator, V_4 a reactance valve, and V_1 and V_2 are comparator diodes. The frequency of operation of V_3 should be 10,125 c.p.s. (line frequency), and the operation of the system depends upon a comparison between the phase of the generated sine wave

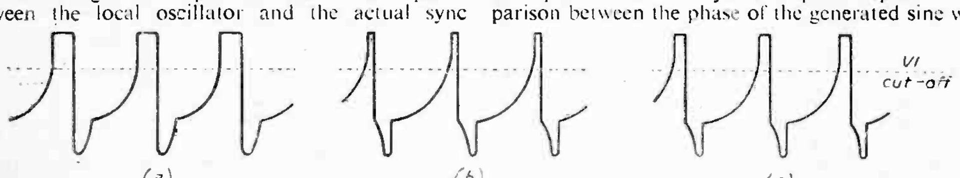


Fig. 4.—Waveform across C2 of Fig. 3.

and the received sync pulses. A phase shift is caused to produce a D.C. voltage which is applied to the grid of the reactance valve which in turn controls the frequency of the sine oscillator.

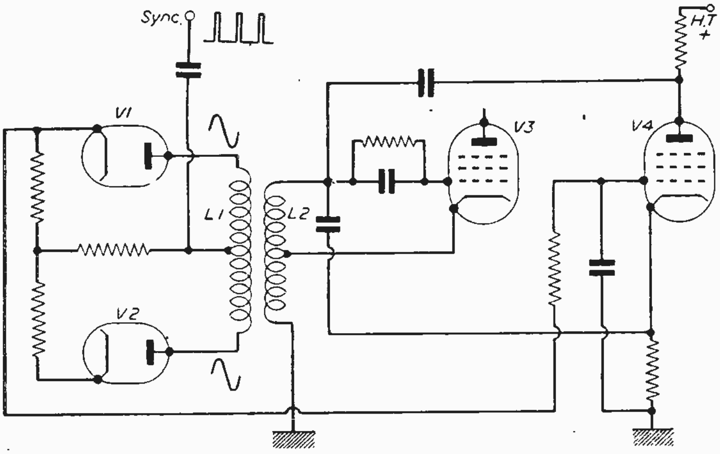


Fig. 5.—Basic circuit for the sine system.

The diodes V_1 and V_2 function in much the same way as a F.M. detector system, the two anodes being wired to a centre-tapped coil L_1 inductively coupled to another winding L_2, also centre-tapped, and forming the tuned circuit of the sine oscillator. With reference to the centre of L_1, sine wave voltages of equal amplitude but opposite polarity are applied to the diode anodes; the sync pulses are applied to the centre point, and as a result this voltage is developed in the same phase and with equal amplitude at each anode.

When the sync pulses and sine waves are properly phased as Fig. 6(a) shows, zero voltage appears at the output of the comparator. If the phase of the sync pulses change with respect to the sine wave, however, one of the diodes will produce a greater output than the other, resulting in a positive or a negative voltage at the output, depending upon whether conditions are as shown at (b) or (c) respectively. This output voltage therefore provides the control element and is injected into the grid of the reactance valve V_4 through a simple filter system which is designed to remove interfering impulses.

When properly set up, this system results in a small amount of blacking-out on the right-hand side of the picture as well as on the left. A serious error results in a blanking area running through the centre of the raster.

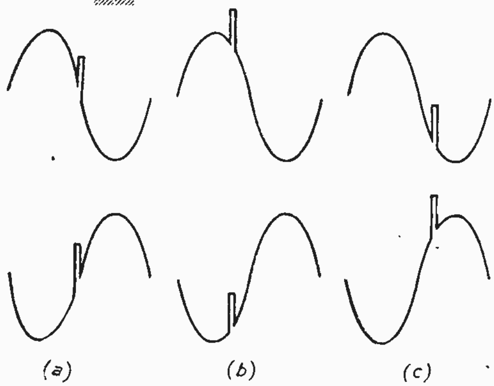


Fig. 6.—Waveform in respect of the Fig. 5 arrangement.

The P.T. "Super-Visor"

THE coils which were specified for this receiver were the Allen Components TK Series, and a few readers have found difficulty in identifying the connections. As supplied by the makers, a paper wrapper surrounds the screening case giving the numbers of the projecting connecting wires. The bakelite coil-formers are, of course, embossed with the numbers but the turned-over retaining flap obscures these and therefore to simplify the constructor's task the wrapper is included. The positions of the fixing holes, will, of course, control the positions of the relative pins and therefore if a ready-drilled chassis is not obtained, care should be taken when drilling for the coils to make sure that the correct orientation of the holes is obtained, as shown in the plan in the August issue. When mounting the coils, therefore, only one reference point is called for the remaining pins coming in their correct position.

In the case of the aerial coil L1A, pin 4 is connected to the grid of V1. The next coil, L2A, B and C is mounted so that pin 3 goes to the grid of V2. The pin which goes from L3 to G2 of V3 is No. 4 and in the case of the I.F. coils pin No. 6 is joined to the grids of the following valves. There are only two connections to L8, so that they must be correct if placed according to the wiring diagram in the October issue, and in L13, the pin joined to the anode of V10 is No. 6. No difficulty should be experienced with the remaining components.

AN IMPROVED SLOT AERIAL

By J. W. Hobley

AERIALS present one of the main difficulties to the modern television enthusiast, mainly on account of the many different patterns which are available, but also because owing to the mounting difficulty the usual procedure is to try to select a design which it is thought will suit, and when once erected the user makes the best of it rather than try to get it down and make or try another type. On this account, any type of indoor aerial offers much more scope—owing to its accessibility. But again, there are various different types of aerial which may be erected indoors, and in many cases these have to be of a compact type, as they have to be fitted in the room in which viewing takes place. Flat-dwellers, particularly, find the aerial problem one of great difficulty, but the house-owner, or the resident who has access to a loft or large unused room in the roof, is more fortunately placed, and considerable interest has been aroused during the past twelve months by the reported results obtained on a very unorthodox type of aerial—the "slot." For newcomers it may be briefly stated that this consists of a sheet of metal with a slot cut in it, and to reduce weight and facilitate construction ordinary wire netting is used. The following simple method of construction is therefore offered for those who wish to experiment with this arrangement, and a table is given in the centre of the page so that the measurements may be modified for any of the present channels.

Station	Overall Dimension	Slot Length
London ...	14ft. 9in. x 5ft.	10ft. 10in. x 1ft.
Holme Moss	13ft. 6in. x 5ft.	9ft. 4in. x 1ft.
Kirk O'Shotts	11ft. 2in. x 4ft. 6in.	8ft. 6in. x 1ft.
Wenvoe ...	8ft. 6in. x 4ft.	7ft. 3in. x 1ft.

The following aerial, which was designed for use in connection with Sutton Coldfield, has proved to be very efficient. It is made from ½in. mesh wire netting 12in. wide which provides good edges all round.

Cut the netting to the size shown in the drawing and hang one long piece on a wall or fence or lay on a level path, and fit a 3ft. piece at each end and bind in the sides and ends with tinned copper wire. Finish the binding at 16 places in all, and solder each one with resin-cored solder. Those places are indicated.

Make three wooden bearers F, and cut a V exactly in the centre of each piece. Fit ebonite bushes made from tubing in each V, and secure by metal straps at L, etc. Slot down the ends of each bearer for 2 in., slide on to the netting and secure by brass screws. Two coats of shellac varnish will improve the insulation of the bearers.

The centre rod or tube E should be of aluminium or duralumin of not less than ½in. diameter, and a sliding fit in the bushes. One end, M, should be fitted with an ebonite plug to give ½in. spacing and the other end a binding screw for the inner wire of the co-axial cable.

To provide the necessary connection between the braiding of the cable K and half of the top edge of the lower strip, the plastic covering should be removed for about 2in. in about eight places as shown at J, and tightly bound to the edge of the slot with tinned copper wire.

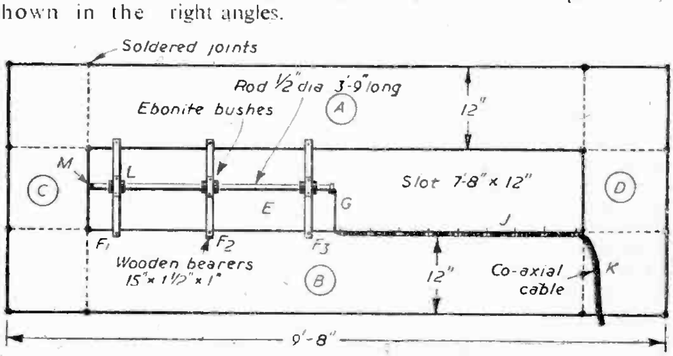
Then remove both plastic and braiding from the end of the cable and take the inner wire up at right angles as at G. Solder on a tag and connect to the binding screw on the rod.

The bearer F1 is provided with a clamping screw to hold the rod and enable it to be withdrawn when necessary.

Results

The slot aerial is rather directional and I have not found that a reflector is necessary. If it is correctly fitted it will give wonderful results.

This aerial can be suspended on cords from the main beam or supported by wooden end brackets. It can be rolled up, an advantage when installing, and requires very little modification to suit it to other TV stations. A table is given above to enable constructors to make a similar aerial for other channels on the same lines. For those who wish to experiment with reflector arrangements a sheet of the same size may be cut, but experiences from readers vary as to the best position and whether or not the reflector should be in the same plane or at right angles.



Full details of a modified slot aerial.

FAULT SYMPTOMS

THE COMMON CAUSES, AND METHODS OF CORRECTION

By Gordon J. King, A.M.I.P.R.E.

(*Continued from page* 265 *November issue*)

BEFORE finally leaving the E.H.T. section of the receiver it will be interesting to consider the symptom of a defective control of picture brightness. The effect is that as the brightness control is advanced, but before its maximum setting, the tube screen reaches a maximum point of brightness, and further rotation of the control reduces, instead of increases, the effective screen illumination; and in severe cases a maximum setting of the control results in no illumination at all.

Generally accompanying this symptom the effect of poor E.H.T. regulation is also well in evidence, for if the overall white level of a picture rises, the picture size tends to enlarge and the focus control is in need of readjustment. The same effect on the picture also occurs when the brightness control is advanced beyond the undesirable critical point.

Investigating the fault conditions of the E.H.T. circuit whilst the picture-tube screen illumination is cut-off—during the time when the brightness control has been fully advanced for this purpose—will reveal that E.H.T. is lacking at the final anode of the picture-tube. Furthermore, an E.H.T. voltage reading will show that as the brightness control is rotated from minimum to maximum, the reading will be about normal at the minimum setting—at normal beam cut-off—but will gradually fall to zero as the control is rotated up to maximum brightness.

It is fairly obvious that as the tube beam current is enlarged—by turning up the brightness control—the E.H.T. system is incapable of providing the additional power and a total collapse of E.H.T. results. This would rightly lead one to suspect that the output impedance of the system has, for some reason or other, gone excessively high.

Usually the E.H.T. rectifier is proved to be the responsible factor, particularly in mains derived E.H.T. networks, but an E.H.T. filter resistor going extremely high in value, or even the line output valve—in flyback E.H.T. circuits—going slightly "soft" have both been known to provoke the same symptom. Modern large screen receivers are very greedy from the E.H.T. aspect, and any slight reduction in efficiency of the system generally is sure to result either in no E.H.T. at all, or a compromise such as the occurrence of this system.

Incidentally, one simple way of determining whether it is the rectifier itself, or the line output valve which is causing the effect is by turning the brightness control to maximum, and then spark testing at the anode of the E.H.T. rectifier; a healthy spark is a sure indication that all is well with the line output stage, and rectifier replacement should effect a speedy cure.

Although the symptom may at first appear far removed from the E.H.T. section of the receiver, and more likely the result of a defect somewhere in the brightness control circuit proper, do not start tearing the picture-tube control circuit to pieces, and replacing components without thought to arrive at the paradoxical conclusion that all is well here and yet the fault still exists. One experimenter known by the writer went to the limit in an endeavour to clear such a fault, and after replacing every component associated with the brightness control circuit, *and* the video output stage, he was guided to suspect E.H.T. trouble, and in a matter of minutes the E.H.T. rectifier valve was replaced and a perfect cure resulted—remember, think before replacing!

Ineffective Control of Line or Frame Holds

Although it is possible that weak synchronising pulses may be responsible for this fault, an unbalanced hold control also provokes the symptom, and we shall consider this aspect first. What usually happens is that the picture appears in perfect lock while the signal is fairly strong and interference free, but any fall-off in signal strength, or sudden burst of interference, may be sufficient to upset the holds and cause the picture either to roll slowly vertically, or jump sideways to produce the effect that is generally known as "false line lock."

When this state of affairs exists for any length

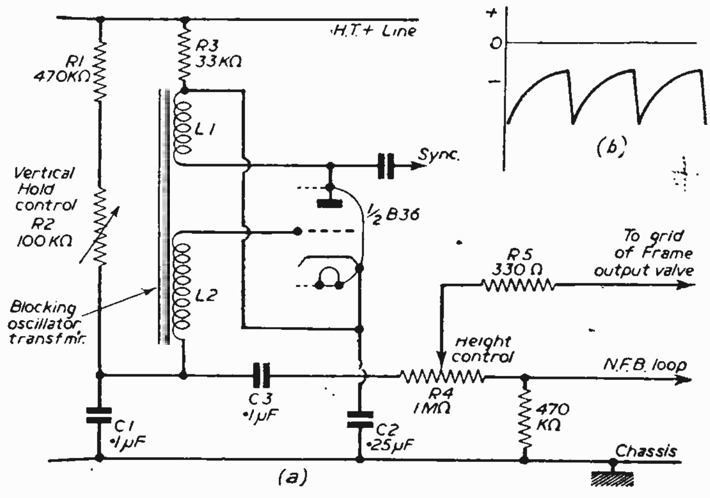


Fig. 16.—This frame generator section is used in the G.E.C. BT2147 series, and the voltage waveform across C1 is shown at (b).

of time one is usually prompted to make adjustments to the appropriate hold control, and it is then discovered that the control is already positioned hard over on one of its stops, and bringing it back within the range of the control's track tends only to make matters worse than they are already. Sometimes, during the course of adjusting in this way, the picture height or width control is accidentally moved to reduce the amplitude of scan and then, when this occurs the picture invariably acquires a solid lock.

A compromise between insufficient picture height or width (depending on which control is defective) and a fairly stable lock is, therefore, available, and although no problem is presented in curing the defect, one would be surprised at the large number of viewers employing receivers exhibiting this symptom. This compromise, however, can only alleviate the effect up to a point, for sooner or later the receiver will demand attention as it will be found impossible to lock the picture, even with a minimum setting of scan amplitude (width or height).

The function of the hold controls is to facilitate varying the repetition frequency of the line and frame sawtooth generators, and their approximate midway settings should allow the unsynchronised generators to work at a frequency slightly less than that of the synchronising pulses, for the pulses initiate the "firing" of the generators and, therefore, speed them up to provide synchronism. Various types of sawtooth generators are in general use, but they all have one thing in common, they all rely on a time constant—a resistor capacitor/inductor combination—to control their unsynchronised repetition frequency, and the time constant is adjustable in the form of the Hold controls. The only difference existing between the frame and line generators is, of course, the value of the time constants, and thus the repetition frequency—50 c.p.s. for the frame and 10,125 c.p.s. for the line.

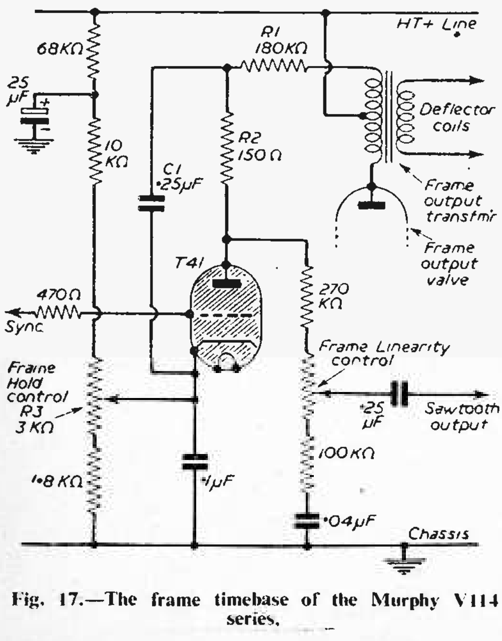


Fig. 17.—The frame timebase of the Murphy V114 series.

What happens then, to cause the symptom we have just considered, is that the time constant alters in value to an extent that cannot be corrected by normal use of the hold controls, or, perhaps, it can be corrected to provide the necessary unsynchronised frequency only at the far end of the appropriate control's range. In certain circuits adjustment to the scan amplitude controls—apart from performing their normal functions—tends slightly to modify the time constant, and, as we have already seen, this provides a degree of counteraction for an otherwise incorrect time constant.

The circuit of Fig. 16(a) depicts a reasonably conventional frame generator of the blocking oscillator mode—this one is, in fact, employed by the G.E.C. in their BT2147 series receivers. To glean an idea of how a variation in time constant can effect an alteration in the frequency of the generator it will first be necessary to consider the general operation of the blocking oscillator.

This is best understood by assuming that the capacitor C1 is initially so charged that the valve is cut-off. Under this condition then, the grid of the valve is negative with respect to the cathode, and in practice the grid often swings as much as 100 volts less than cathode. An anode current test, when the valve is oscillating, may reveal something less than half a milliamp (barely perceivable on an average meter); this is quite normal, and should not prompt one to suspect a defective generator—indeed, one should become suspicious if the anode current assumes a magnitude which would appear normal for the valve operating under conditions of amplification!

Capacitor C1 discharges through R1 and R2, and the grid becomes progressively less negative until it reaches the cut-off voltage of the valve. At this point the valve starts to draw anode current which flows through R3 and the blocking oscillator transformer primary winding L1. A back E.M.F. is, therefore, developed across this winding and the anode voltage starts to drop below the H.T. line voltage. A similar E.M.F. is also developed across the secondary winding L2 in such a direction that the grid potential becomes less negative.

This further increases the anode current, and a half-cycle of oscillation is performed which is so violent that it leaves the circuit paralysed, for during this period grid current flows and again charges up C1 to bias the valve well to beyond anode cut-off.

During the quiescent period of anode current cut-off C2 charges from the H.T. line via L1 and C3, but this charge is quickly drained away when the heavy anode current commences to flow—during the working half-cycle of oscillation. The reducing negative voltage across C1 forms the scanning stroke (Fig. 16(b)), and this is passed on to the output valve control grid via C3, R4, and R5. It should be noted, however, that certain receivers utilise the rising voltage across C2 to form the scanning stroke, but in either case the effect is the same, for the charge in C2 goes on increasing, and the charge in C1 goes on decreasing (falling *less* negative), until a point reached at which the anode voltage and control grid voltage are suitable for the commencement of oscillation.

Charging Time

From the foregoing, then, we can clearly see that the main frequency governing feature of Fig. 16(a) is the charging time of the control grid circuit, for when conditions are normal, the time constant of the circuit C1, R1, and R2 determines the repetition frequency of the generator. Therefore, when a fault occurs that renders the correct operating frequency outside the range—or at one side—of R2, the grid circuit should be examined for a variation in component values.

Usually, the component in Fig. 16(a) which provokes the effect more than any other is R1, for this frequently tends to go high in value to an extent that cannot be counteracted by R2. The hold control itself rarely gives trouble in this respect, apart from, perhaps, becoming "noisy" or erratic in operation. The charging capacitor C1 less frequently alters in value, but it should be remembered that, although the value of C1 may remain unchanged, a leakage across it is bound to modify the resistive content of the time constant.

The valve itself should not be overlooked, of course, for even though it may provide a full scan amplitude, a deviation in its characteristics can upset the overall time constant of the circuit. The B36 appears to be particularly prone to such characteristic alterations, especially after it has aged a little, and this is probably the result of a variation in grid-base. Usually, however, the effect is not sufficient to warrant valve replacement, and, in any case, it is a simple matter to shunt or increase the value of R1 to provide the correct generator frequency at the midsetting of R2.

Time Constant

It must be borne in mind that the time constant C2 R3 is also involved in the operation of the generator, and it can quite well be seen, therefore, that a defect in the anode circuit could cause the same symptom. It is evident, therefore, that if the obvious components to suspect check normal, and component substitution proves no degree of alleviation, the symptom might well be due to a less obvious fault factor associated in some remote way to the timebase circuit generally. In this respect we can see how an alteration in the setting of the picture height (or width) control might tend to provide that slight balance necessary to bring the generator into step with the sync pulses, should an alteration in the time constant occur to render the correct generator frequency only just outside the range of R2.

When investigating any fault of this nature it is as well to remember that an *increase* in capacitance or resistance will *lower* the speed of the generator, or vice versa, and when the generator is running too slowly a black band due to the sync pulse will move slowly up the picture. In extreme cases (should the frequency fall to 25 c.p.s.) a split picture will resolve in perfect synchonism, with the bottom half of the picture at the top of the screen, and the top half at the bottom of the screen. On the other hand, when the generator is running slightly too fast, the black band due to the frame sync pulse will move slowly down the picture, and when the generator speed is excessive, the picture may be folded over.

Sometimes a defective blocking oscillator transformer provokes the condition for an incorrect generator frequency, and, although this type of transformer is remarkably reliable, it should not be overlooked during the course of investigating a timebase defect. Short circuit turns within the transformer is the main factor which causes this sort of trouble, and, as with the line output transformer this defect is often difficult to establish with any degree of satisfaction—apart from substituting, of course. Applying pressure to the windings while the receiver is operating under fault conditions has been known to reveal such a defect; but, generally speaking, when the symptom is due to the transformer, the hold control has little affect on the frequency of the generator and extreme raster distortion is also well in evidence.

"Soft" Valve

Another widely-used saw-tooth generator is the gas-filled triode ("soft" valve). A generator of this type is shown in Fig. 17, which depicts the frame timebase circuit of the Murphy V114 series. The gas-filled valve functions quite differently from an ordinary "hard" valve, but, nevertheless, the repetition frequency is still determined by the time constant of the circuit.

When this type of valve is conducting the grid exercises little or no control on the anode current. It is not possible, for instance, to stop the anode current by driving the grid negative, as with the "hard" valve, but only by removing the anode voltage. The valve, therefore, has two modes of operation. The first is with the gas in its de-ionised state, and little or no current flowing through the valve. The second mode of operation is with the gas in the ionised state, and a heavy current flowing through the valve.

If the grid is kept at a negative potential and the anode voltage is raised from zero, the valve remains in a de-ionised state until a certain critical anode voltage is reached. At this *upper* critical voltage the valve commences to ionise, and remains in this state until the anode voltage is reduced below another *lower* critical value. The change over between the two modes of operation depends on the product of the applied bias and a constant. This constant is known as the *control ratio*, and is a characteristic of the gas-filled triode.

By increasing the negative bias the upper critical anode voltage is made higher, and by reducing the bias, it is made lower. Another important factor is that if the anode voltage is between the upper and lower critical values, and the valve is in a de-ionised state, it will immediately ionise if a positive going pulse is applied to make the grid go *less* negative.

With this in mind, then, and referring again to Fig. 17, we can easily realise how the generator functions in conjunction with the time constant components, C1 and R1. We can see that C1 charges from the H.T. line through R1 until the voltage across it corresponds to the upper critical anode voltage of the valve. At this point the valve ionises and conducts heavily to rapidly discharge C1 through R2 and the valve.

Clearly, then, the actual scanning stroke—as with the blocking oscillator—is the charge build up across C1, which is conveyed, via the linearising network, to the control grid of the frame output valve. The variable resistor R3 changes the cathode/grid potential and acts as a frequency control (hold control), for as the negative bias is enlarged, the valve demands a higher critical anode voltage, which obviously takes a *longer time* to build up across the charging capacitor. Also, of course, any alteration in grid bias is bound to affect the amplitude of scan, but this is of little consequence when the generator is synchronised, and in the circuit cited a control of picture height is catered for in the frame output stage.

It may be instructive to consider here the function of the charging circuit when the generator is synchronised. C1 charges through R1 as before but, under conditions of synchronism, the charge across the capacitor does not reach the upper critical anode voltage, because a short time before this a *positive* going sync pulse is applied to the grid, which effectively reduces the negative bias and initiates ionisation, and the discharge of the capacitor.

The 150 ohm resistor R2 is included in the circuit to limit the discharge current to a safe value, for it must be remembered that, during its ionised state, the internal resistance of the valve is extremely low, and is liable to suffer damage if the capacitor voltage is large.

The reason for supplying the charging circuit through a tertiary winding on the frame output transformer in this particular circuit is to provide a degree of waveform linearisation, for as the curvature of the scanning stroke at the output stage is opposite to that across the capacitor, the combined effect of the two oppositely distorted voltages tends to reduce the overall curvature, to provide a more linear frame scan.

Faults affecting the repetition frequency in this style circuit are generally extremely simple to trace, once the components associated with the charging circuit are located. Owing to the comparatively large value of the charging capacitor, in frame generator circuits particularly, it sometimes tends to age by reducing in value and becoming slightly "leaky." This not only alters the frequency of the waveform by modifying the time constant, but usually a degree of raster distortion, or cramping, at the *bottom* of the picture also occurs. The charging capacitor is, therefore, considered as an extremely critical component in the "soft" valve generator, and for this reason should possess perfect insulation, coupled with a low tolerance factor; this applies particularly to a replacement component.

Once the generator is synchronised the value of the charging resistor, paradoxically, has little effect on the frequency of the sawtooth waveform, and an alteration in value, instead of pulling the generator out of sync as would be expected, simply alters the *amplitude* of sawtooth voltage, and hence the picture height. Certain receivers, in fact, employ a variable charging resistor to facilitate the control of scan amplitude. It is, therefore, worthy of note that should a receiver employing a "soft" valve generator manifest the symptom of insufficient picture height, or width, the appropriate charging resistors should be suspected for an increase in value.

The "soft" valve and the blocking oscillator represent the two sawtooth generators which are most widely used in current design. Since the "soft" valve requires a higher H.T. voltage for a given degree of linearity than does the blocking oscillator, for instance, it is employed only in receivers of the pure A.C. type where a mains transformer is used to provide H.T. power. Certain circuit variations do, however, occur in their make up; and in this connection a pentode valve is sometimes adopted, in place of a triode, in blocking oscillator circuits.

The method of applying the synchronising pulses also varies. Some manufacturers prefer feeding positive-going pulses into the control grid circuit, while others apply negative-going pulses directly to the anode. The same effect is produced in either case, however, for the positive pulses in the grid winding of the transformer induces current pulses in the anode winding in such a direction to give the anode a negative "kick."

Reversed Sync Pulses

It has been known for a constructor to design and build a receiver, and on testing discover that it is impossible to obtain a satisfactory frame or line hold. It is probably found that, in the horizontal sense, for instance, the picture only holds firmly when it is half-way across the screen, and that a black vertical bar appears in place of the missing section of picture.

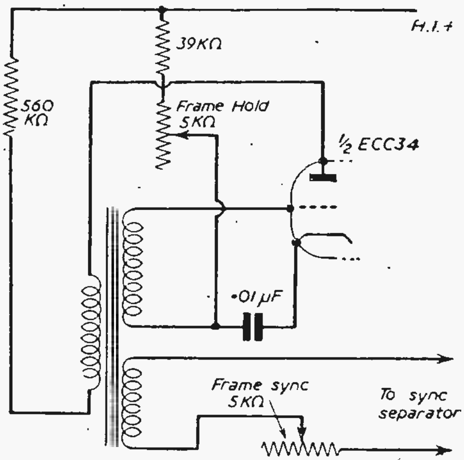


Fig. 18.—Method of sync coupling employed in the Pye D16T series.

Usually a ghostly trailing effect is observed in the black section when an image moves across the picture section. This is very similar to "false line lock," but in an endeavour to correct this by adjusting the line hold control, the synchronism is lost altogether and the picture tears horizontally.

After much puzzling and testing the reason for this phenomenon becomes apparent. The constructor discovers that negative-going sync pulses are being applied to the grid or, perhaps, that positive ones are being applied to the anode! Although the generator still locks to a degree when the phase of the sync pulses is incorrect, the trailing edge, instead of the leading edge of the pulses initiates the flyback, and a certain amount of delay occurs to produce the symptom described. Certain commercial receivers are arranged to function in this way.

Sometimes inductive sync coupling is employed in the frame generator circuit. An arrangement after this style, as embodied in Pye D16T receivers, is depicted by Fig. 18. The main features of the circuit is the additional sync winding on the blocking oscillator transformer and the frame sync amplitude control. The blocking oscillator itself follows conventional design, and the sync pulses are applied across the special winding in such a way that the anode of the oscillator is subjected to the usual negative "kick" demanded for correct synchronism.

(To be continued)

TV for the Beginner—7

THE SEVENTH ARTICLE OF A SERIES EXPLAINING THE PRINCIPLES OF RECEPTION FOR THE NEWCOMER TO TELEVISION—THIS MONTH WE DEAL WITH COILS AND COIL WINDING

By "Alpha"

(*Continued from page* 272 *November issue*)

ALTHOUGH it was intended to end this series last month, many readers have asked for other details, such as coil-winding data, so we are continuing the series. The construction of coils for television frequencies is really a very simple operation and is well within the capabilities of the home constructor. An understanding of the inherent properties of such coils should enable the novice to construct them with confidence.

Present-day practice is to wind TV coils on special small coil formers. These formers are available in two main types—the open types with a diameter of ¼in. or ⅜in., and the screened type with a diameter of ⅓in.

The latter type conform to commercial standards and are so constructed that two coils for coupling purposes can be wound on the same coil former.

Factors Affecting the Tuning

The tuning range of a coil is governed by three characteristics : (a) the inductance of the coil, (b) the capacitance of the coil, and (c) the parallel capacitance of the associated circuit.

The inductance is controlled by two factors, the first being the number of turns in the coil, and the second the presence of and material of the core.

With coils using so small a number of turns there is very little difference between the maximum inductance caused by close winding and that caused by open winding. (By closewound coils we mean that the coils are wound so that adjacent turns touch each other ; the wire is, of course, insulated. By open winding, or spaced winding as it is sometimes termed, we mean that adjacent turns are at a specified distance from each other.)

One advantage of spaced windings is that the turns can be counted more easily than with close winding, and another point is that the minimum inductance (i.e., when the core is right out) is less. When the core is right in so that it embraces the windings, then the maximum inductance is about the same in each case if the number of turns are the same.

The material of the core used for tuning has an important effect. Iron-dust cores increase the inductance and hence decrease the frequency to which the coil is tuned. As an example, supposing a coil tunes to the vision frequency of, say, Holme Moss on 51.75 Mc/s when the core is almost right out (i.e., minimum inductance), then as the core is screwed in to embrace the windings the tuning will shift to the sound channel on 48.25 Mc/s.

If the material of the core is brass, however, the frequency will be increased. Supposing we have a coil which tunes to Holme Moss sound with the iron core almost out of the coil (48.25 Mc/s) and then we introduce a brass core, it will be found that the coil will now tune into Holme Moss vision (51.75 Mc/s).

The same effect can be obtained by altering the number of turns. In the first case (decreasing the frequency to tune in the sound) approximately the same effect could be obtained by adding a turn to the coil. In the second case (increasing the frequency to obtain vision), approximately the same effect could be obtained by taking a turn from the coil.

We can use this to counteract mistuning of the coils due to the wiring. If a coil will tune in the vision and not the sound when we want it to tune in the sound, then a turn can be added ; on the other hand, if our coil tunes in the sound when we want the vision, then a turn can be taken off.

Brass cores have another effect which is particularly useful in television. Minute currents flow round the core (termed eddy currents) and these couple with the coil turns and flatten the tuning ; in other words, the bandwidth covered by a coil tuned with an iron core can be increased by using a brass core.

Stray Capacitances

The self-capacitance of these small coils is very small and the greater part of the capacitance which controls the tuning range is found in the external circuit.

The capacitances found in the external circuit (the wiring and valves) has a material effect on the tuning range.

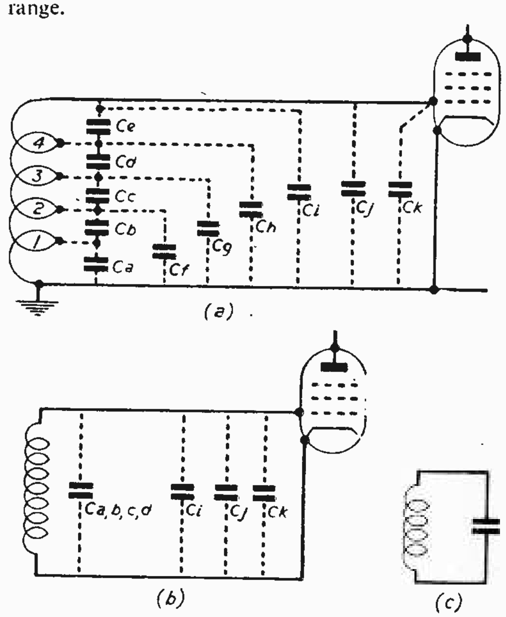


Fig. 1.—Diagram illustrating the stray capacities which exist in a circuit.

Adding a condenser across a coil reduces the frequency to which it will tune.

Fig. 1 shows a simplified diagram of the stray capacitances in a grid-connected coil. Ca is the capacity between turn 1 and earth (chassis). Cb is the capacity between turn 2 and turn 1, while Cf is the capacity between turn 2 and earth. Cc is the capacity between turn 3 and turn 2, while Cg is the capacity between turn 3 and earth. Between turn 4 and turn 3 we have the capacity Cd and between turn 4 and earth there is Ch. Between turn 4 and the top of the coil we have Ce, and between the top of the coil and earth we have Ci. Cj is the capacity between the wire from coil to grid, and earth, while Ck is the capacity between the grid of the valve and earth.

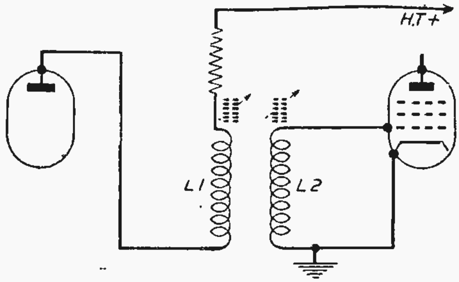


Fig. 2.—Stray couplings in a loose-coupled circuit.

The resultant capacity of Ca, b, c, d, and e can be resolved to that of a single item and the diagram then becomes much simpler, as shown in Fig. 1b.

It can now be seen that there is a total of three capacities in parallel between the top and of the coil and earth, which simplifies to a single capacity as shown in Fig. 1c.

The distributed capacity in the coil itself (Ca to Ce), depends upon the method of winding the coil (spacing of turns) and the position of the coil in the chassis. If the coil is positioned closer than about half an inch to the walls of the chassis or a screen then the capacities Ca to Ce will be increased and the tuning of the coil will be altered to a lower frequency.

Capacity between the valve grid and earth will depend upon the make-up of the valve and the valve-holder, and is fairly constant for certain types of valve.

The capacity between the wiring and chassis is very much under the control of the constructor. All wires in tuning circuits should be kept as short as possible and clear from the chassis.

Total stray circuit capacitances may amount to as much as 20 pF and this has to be taken into consideration when designing the coils.

Coupled Coils

An example of coupled coils is shown in Fig. 2. If the coupling is loose then each coil can be tuned, individually as a single coil. By loose coupling we mean that the distance between the coils is large as compared with their size. Where the coils are mounted on a single former, then one coil at one end of the former with the second coil at the other end of the former means that the coils are loosely coupled, assuming that there is some distance between the nearer ends of the coils.

Fig. 3a shows loosely-coupled coils and Fig. 3b shows tightly-coupled coils.

Loosely-coupled coils can be treated as separate items, so far as the tuning is concerned, but as the distance between them is reduced so will the tuning of the one affect the other. To tune coils which are tightly coupled the best method is to connect a resistance of 470 ohms across the coil which is not being tuned, so as to reduce the effect of interaction.

To tune L1 and L2 when tightly coupled, the procedure would be to connect a 470-ohm resistance across L2 and tune L1; the resistance should then be connected across L1 and L2 tuned.

Transference of signal from one coil to the other depends upon their coupling; the tighter the coupling then the greater is the power transferred.

The maximum transference of power is obtained when the windings are interleaved as shown in Fig. 4. This method of winding is termed "Bifilar Winding." A single core can be used for tuning and the complete coil treated as a single-wound coil.

Direction of Windings

With single coils the direction of winding can be clockwise or anticlockwise, but with coupled coils the directions given in the data should be accurately followed.

Wire Gauge

Tuning coils for TV. can be conveniently wound in 32 s.w.g. wire, which is a popular size for the amateur. Sizes greater than this can be used but gauges above 22 s.w.g. become difficult to handle. Generally speaking any gauge between 22 and 32 will be found suitable and if, say, 22 is specified and only 28 is to hand, then the 28 gauge can be used.

One factor determining the gauge is the rigidity of the turns. When using the screened type the wire is conveniently anchored by longitudinal wire of 18 s.w.g. which extends through the base. Soldered connections to the coil are made by means of these wires. In this case the smaller gauges can be used. The Alladin type of former (the open kind), rely quite often on the coil wiring being connected directly into the circuit, the coil being kept rigidly in place by virtue of its connecting ends. It is usual in these cases

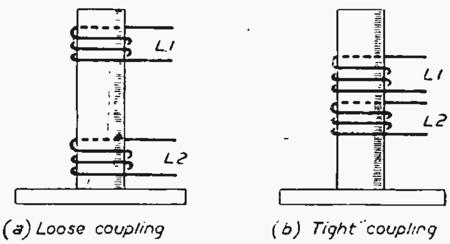
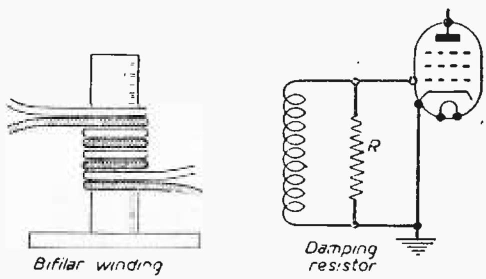


Fig. 3.—Loosely and tightly coupled coils.



Figs. 4 and 5.—Bifilar winding and method of broadening tuning.

to specify a larger gauge in the 22 s.w.g. class.

Coil dope can be used to keep the turns in position, but it should be real coil dope and not material of doubtful origin. Some dopes not only introduce losses but add to the total capacity.

Whether the coils should be wound with insulated wire or not depends upon the designer, and his instructions should be followed. Tightly-coupled coils should have their turns insulated from each other, though it is only necessary to insulate one of the windings.

Oscillator coils are a special case and the main requirement is rigidity. For this reason it is common practice to use larger gauges of wire in the region of 12 s.w.g. The coil is generally retained in position by its own two ends, the coil former being dispensed with. (Incidentally, this method, which has been employed extensively in commercial receivers, enables the oscillator coil to be identified with ease.)

Bandwidth

The television vision signal covers a band of 3 megacycles per second. This is wider than the average coil will cover, and two methods are employed to widen the tuning of the coil; the first is to use brass cores as mentioned in a previous paragraph, and the second is to add "damping" in the form of a resistance connected across the coil (Fig. 5). The lower the value of this resistance, the greater is the damping effect it has on the coil, and the greater the bandwidth of the coil.

The effectiveness of the resistance will depend upon the input resistance of the valve and values above 6.8 kΩ have very little effect with modern V.H.F. valves.

An important point to note is that the lower the value of this resistance the lower is the gain of the stage. In fringe areas it is as well to leave the resistance out, as any slight loss in the quality of the picture will be compensated for in the increased gain.

It is standard practice to effect an overall correct bandwidth in the vision receiver by "stagger" tuning the amplifying stages. This is accomplished by arranging the different coils in each amplifying stage to amplify a certain section of the band. As an example of the process, imagine that we have to amplify a vision signal which extends from 60 Mc/s to 63 Mc/s. Using four stages of amplification we could make our first coil tune to 60 Mc/s, the second coil to 61 Mc/s, the third to 62 Mc/s, and the fourth to 63 Mc/s; we have thus covered the whole band.

In actual practice, the staggering does not follow in sequence as given above but the section of the band amplified by each stage is arranged according to the actual circuit conditions.

It will be seen that as the different coils have to cover a particular section of the band the number of turns on each coil will be individual to that coil.

Rejector Coils

With the present single side-band method of transmission, the sound channel is necessarily placed quite close to the vision channel. Now our aim is to make the vision amplifier deal with a wide band of frequencies and some overlapping will occur, the sound channel being picked up in the vision circuits.

It is necessary, therefore, to filter out the sound from the vision and this is accomplished by using a coil to trap the sound. Such coils are termed sound traps, or sound rejector coils.

The tuning of these coils must be made as sharp as possible; if they tune broadly then they will trap some of the vision signal as well as the sound. Such coils must have a high inductance and minimum resistance, and should be spaced so that no damping is effected by nearby chassis or screens.

It is essential that the designer's instructions regarding rejectors is adhered to rigidly or trouble from sound break-through will be experienced.

BBC Engineering Appointments

THE BBC announces the following new appointments in the Engineering Division.

Mr. H. Walker, O.B.E., A.M.I.E.E., becomes Assistant Superintendent Engineer, Television Studios.

Mr. W. D. Richardson becomes Assistant Superintendent Engineer, Television Outside Broadcasts.

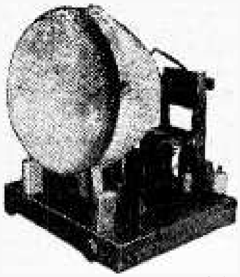
Mr. Walker joined the engineering staff of the BBC from the R.A.F. in 1931. After service at Savoy Hill, Broadcasting House and Newcastle, he transferred to the Television Service in 1936. In August, 1939, he was recalled to the R.A.F. in which he served throughout the war, attaining the rank of Wing Commander. He returned to the Television Service of the BBC in October, 1945, and was appointed Assistant Engineer-in-Charge at Alexandra Palace in the following year. In 1950 he became Engineer-in-Charge, Alexandra Palace and in 1952 Head of Technical Operations, Television Studios, which post he has held until his present appointment.

Mr. W. D. Richardson joined the BBC as a maintenance engineer, at Brookmans Park Transmitting Station in 1930. Early in 1936 he transferred to the Television Service at Alexandra Palace, becoming a senior maintenance engineer in 1938. Throughout the war he served in the BBC's Planning and Installation Department, returning to the Television Service in December, 1945. Early in 1946 he was appointed Senior Planning Engineer to Television Outside Broadcasts, becoming Assistant Engineer-in-Charge Television Outside Broadcasts in the following year and Engineer-in-Charge Television Outside Broadcasts (London) in 1952. He held this position until he took up his present appointment.

THIS MONTH'S SNIP

One of this country's largest Manufacturers changed the design of their Televisor recently; consequently we are able to offer you a very fine cabinet at well below cost. The cabinet is suitable for Televisors using tubes from 12in. to 17in., its overall dimensions being 3ft. 5in. high x 1ft. 4in. deep x 1ft. 10in. wide. It is complete with back fitted with "bowler hat," nicely polished walnut veneer.
Price £6/19 6, carriage, packing, etc., **12/6.**

THE SUPERIOR 15in.
Up-to-the-minute big picture T.V.



Our "Superior 15" has proved quite easy to construct and we are glad to say that most purchasers now have theirs working, some, in fact, have already started on a second model for a friend.

Unfortunately, due to the increased prices of certain items, the cost of all components, valves and Cossor 15in. tube is now **£37.10.0.** (H.P. deposit now **£12.10.0.**) Plus £1.0.0 carriage and insurance. Nevertheless it is still an exceptional bargain for it employs all the latest features—line fly-back E.H.T.—noise suppression—diode damped interlace, etc., etc.

A constructors' envelope, giving full details with blueprints, is available price 7 6d. (returnable within 14 days if you decide not to make the set). Working models can be seen at Fleet Street, Ruislip and Finsbury Park. A beautifully finished walnut cabinet has been made for the "Superior 15." Price is **£11.10.0** (or **£3.17.0** deposit). Carriage £1.0.0. This now means you can have a really super T.V. for less than £50.

AUTO-RADIOGRAM 29 gns.

Full-size walnut Console CABINET **£11.10.0.** plus 15/- carriage. 5-valve all-mains superhet RADIO. 3 waveband coloured illuminated scale, fully guaranteed, **£9.19.6,** plus 7 6 carriage and insurance. Record changer, Collaro 3-speed with dual pickup.

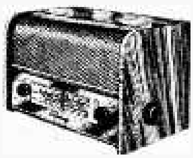
SPECIAL OFFER. Three units for **29 gns.** or **£10.14.0** deposit and 12 monthly payments of **£2.3.0,** plus carriage and insurance. **Booklet of photos, circuit diagrams, etc., 2/6 (returnable).**

Complete kit comprises Hi-craft 40 watts control unit, starter lamp, lamp holders, clips and wiring diagram. Price less tube, **22/6,** plus 1/6 post. With tube **30/-,** carriage and insurance 3/6. Tubes 7 6 each, carriage free, minimum quantity 6.

LAST FEW £3/19/6

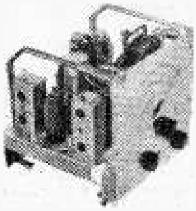
The Lectross warms rooms as it dries clothes. Size 3ft. wide, 3ft. high and 5in. deep. It has four stove-enamelled rails and works off A.C or D.C. mains, consuming 650 watts. Fully guaranteed. Price **£3.19.6,** plus 7/6 carriage.

'ELPREQ' WOLSEY
5 VALVE A.C./D.C. SUPERHET



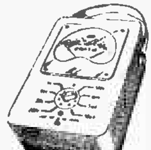
Long, medium and short waves, in handsome wooden cabinet, illuminated glass dial with station names, A.V.C. and usual refinements, size 11in. x 5½in. x 7in. with B.V.A. valves and built-in aerial. 12 months' guarantee, **£9.5.0** or **£3.2.0** deposit and 12 monthly payments of **13 6.** Plus 5/- carriage and insurance.

SUPERHET RADIO by BEETHOVEN



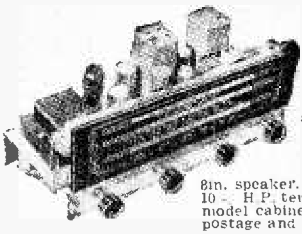
Extremely well built on chassis, size approx. 9¼ x 7¼ x 8¼, using only first-class components, fully aligned and tested—110-240 volt A.C. mains operation. Large clear edge-lit dial. Three wavebands covering 200-550, 35-120, 13-42 metres. Complete with five Mullard valves, frequency changer, double diode triode, pentode output and full wave rectifier. Complete with Rola loudspeaker ready to operate. Special cash with order price this month, **£7.17.6,** carriage and insurance 7 6. Hire purchase terms, **£3** deposit, balance over 12 months.

MULTI-METER KIT



The Multi-meter illustrated measures D.C. volts, D.C. m-Amps and ohms. It has a sensitivity of 200 ohms per volt and is equally suitable for the keen experimenter, service engineer or student. All the essential parts including 2in. moving coil meter, selected resistors, wire for shunts, 8 point range selector, calibrated scale, stick on range indicator and full instructions for making are available as a kit, price **15/-,** plus 9d. post and packing.

THE "WINDSOR"



This is a 5-valve A.C. superhet, covering the usual long, medium and short wavebands. It has a particularly fine clear dial with an extra long pointer travel. The latest type loctal valves are used and the chassis is complete and ready to operate. Chassis size 15in. x 6in. x 6in. Price **£9.19.6** complete with 8in. speaker. Carriage and insurance 10/-. H.P. terms **£3.7.0** deposit. Table model cabinet to suit—37 6 plus 3/6 postage and insurance.

TABLE RADIO CABINET

Due to a special purchase, we are able to offer this very fine cabinet, size approx. 16 x 16 x 7—walnut veneered and satin finished. Complete with 3 colour 3 waveband glass scale at only **37 6d.** carriage and packing 3 6d. This cabinet is the correct one for the chassis above.

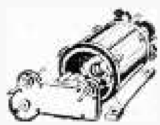
HUGE NEW PURCHASE

We have purchased another large quantity of the Collaro Auto record changer, type R.C.3 521, three-speed suitable for all types of records and with the latest type crystal pick-ups.
Buy one this month as you will not be able to again at this special price of **£10.0.0,** plus 7 6 carriage and insurance.

BE PREPARED

for a cold winter by making our low cost **Electric Blanket.** 27 yards of special heater wire and blueprint, **20/-.** Blueprint only 1 6.

MULTI-SPEED MOTOR



Works off A.C. D.C. mains fitted with gearbox, any speed from 1 r.p.m., **12 6,** post and packing 1 6.

ELECTRONIC PRECISION EQUIPMENT Dept. 5
42-46 WINDMILL HILL, RUISLIP, MIDDLESEX • 152-3 FLEET ST. LONDON E.C.4.
also 29, STROUD GREEN ROAD, FINSBURY PARK.

Television in 3-D

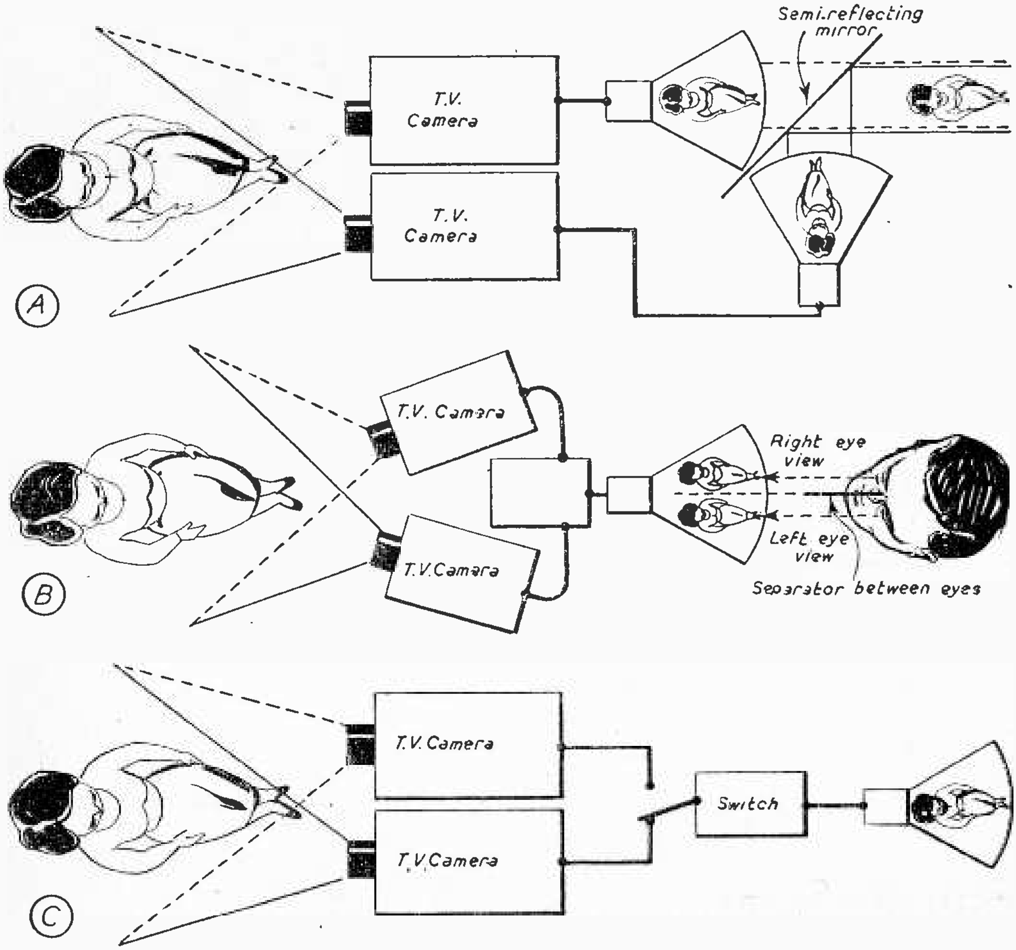
A BRIEF ACCOUNT OF SOME CURRENT AMERICAN EXPERIMENTS IN STEREOSCOPY

TELEVISION, which is generally credited with having forced the motion picture industry into 3-D film-making, will now compete with movies in this direction. For the past several months engineers of major TV networks in America, as well as some independents, have been experimenting with stereo TV systems. *Tele-Tech*, business magazine of the electronics industry, in its May, 1953, issue, describes three systems, one or all of which it is predicted will début nationally before long.

If successful, stereo TV will tend further to solidify the position of films in television ; major studio 3-D film productions will become potential TV programme material, and impetus will be given to the production of 3-D films especially for television.

Tele-Tech makes the following statement, according to our contemporary the *American Cinematographer* : " The big rush into 3-D films has been stimulated to some extent by the inroads made by TV in attracting the public's entertainment attention. In what has been described as a counter-attack, several TV interests are developing means for getting 3-D on the TV picture screen.

" R.C.A. and Dumont Labs. are among the large TV firms who have developed stereo TV for medical and industrial use. A double TV camera is employed to produce two images on two separate picture-tubes (see diagram). These are polarised in mutually perpendicular planes and superimposed optically by a semi-reflecting mirror. When viewed through Polaroid spectacles, the double image produces a stereo picture.



Three methods of producing television pictures in 3-D. A is the R.C.A. and Dumont system ; B is the split image arrangement and C the synchronised shutter scheme.

"In TV broadcasting, American Television, Inc., under the direction of U. A. Sanabria, has come out with a stereo TV system which requires a 'synchronous lorgnette' similar to the shutter plan used in early 3-D movies. The cylindrical viewing device mounted on a stand contains a motor and rotating shutters for each eye that open and close 15 times per second to match the frame rate. At this speed, flicker is encountered. At the studio, an electronic switch alternately selects the outputs of two adjacent TV cameras. More work is required on this system, but the basic idea appears promising.

"An extremely simple stereo TV technique was recently introduced on KSL-TV, Salt Lake City, by a photographer who arranged to have his pair of stereoscopic photos picked up by the regular studio TV camera. In their homes, viewers were told to look at the nearly similar side-by-side pictures through two postal tubes (one for each eye), or to arrange a cardboard separator so that each eye saw only its own side of the screen. About 50% of the viewers were able to obtain satisfactory 3-D effects. Some were able to see stereoscopically even without tubes by paralleling their eyes with distant focus.

"A variation of this separator method for industrial use employs two adjacent TV cameras. Simultaneously, each one produces an image on half of the picture tube.

"Milton L. Gunzberg, President of Natural Vision, is working on a 3-D TV system which will not require glasses. He has tried it successfully, but it is 'fuzzier' than systems using Polaroid lenses. Gunzberg, who says that 3-D TV will be here before colour, reportedly has a receiver attachment which could sell for about $15, enabling the set owner to obtain the 3-D effect."

Stereo Spectacles

As we go to press yet another scheme has been reported from the U.S.A. This system does not call for any modification to either transmitter or receiver, but it is stated that it gives the best effects when the televised scene has a lot of movement. The idea was perfected by the wife of an inventor who owns several patents for three-dimensional films, and the system has been named "Genescope."

Special spectacles have to be worn and these contain a system of balanced filters, although the method in which two separate "eye views" are obtained has not yet been revealed. It is stated that the invention will be made available to the industry free of charge.

Increasing Picture Size on a 6in. Tube

By R. A. Hill

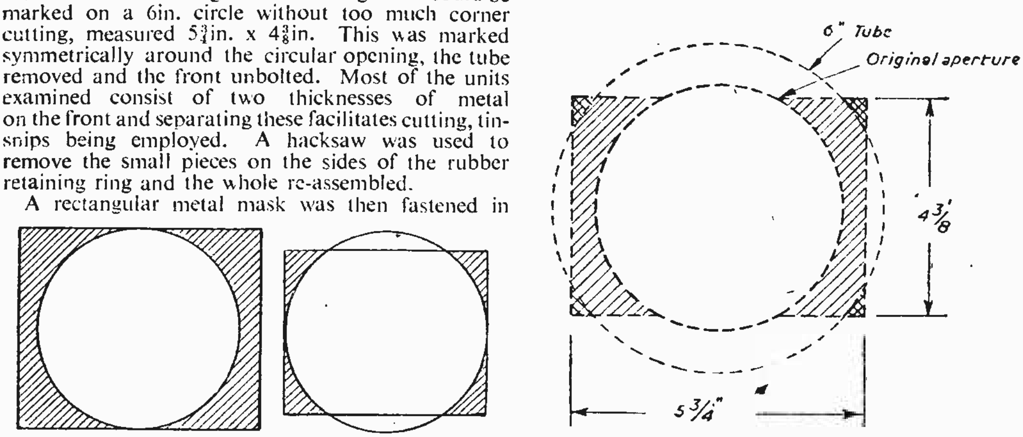
THIS hint is intended for those constructors who have retained their 6in. tubes in the Indicator Unit chassis and have not explored the possibility of improving the size and shape of the picture. Used in this way, the picture can be arranged as in Fig. 1, but in filling the tube a great amount of side detail is lost. A second alternative is shown in Fig. 2, with a D-ended picture, but once again some side detail is missed and a large area of the tube unused. This is chiefly due to the fact that although a 6in. tube is employed, the diameter of the opening in the front of the chassis is only 5in. Using it like this will, if the tube face is filled, give a picture area of approximately 19½ sq. ins.

It was with this thought in mind that the writer attempted to use some of the "hidden" tube. It was found that the largest 4 : 3 rectangle that could be marked on a 6in. circle without too much corner cutting, measured 5¾in. x 4⅜in. This was marked symmetrically around the circular opening, the tube removed and the front unbolted. Most of the units examined consist of two thicknesses of metal on the front and separating these facilitates cutting, tin-snips being employed. A hacksaw was used to remove the small pieces on the sides of the rubber retaining ring and the whole re-assembled.

A rectangular metal mask was then fastened in front, with a rectangle 5¾in. x 4⅜in. cut-out, which covered what remained of the original circle, bolt holes, printing, etc., on the front of the chassis and was just filled by the picture. The picture area now is approximately 26 sq. ins., an increase of 33⅓ per cent., quite important when dealing with a small tube.

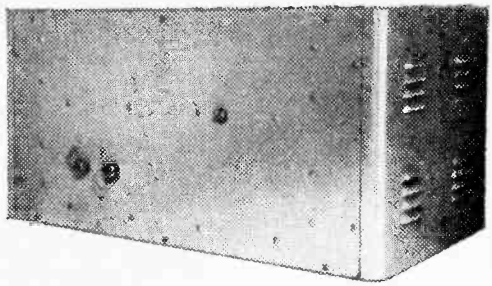
Fig. 3 shows the amount of metal to be removed and also that now only the extreme corners of the picture are missing. It is quite interesting to see the final result and then compare it with the original and then one will realise that the work involved has more than justified the improved shape and appearance.

The addition of an enlarger will further increase the size of the picture.



Figs. 1, 2 & 3. —Comparisons of picture size on 6in. tube.

A Video SIGNAL GENERATOR



DETAILS OF AN ELABORATE PATTERN GENERATOR WHICH WILL BE FOUND OF GREAT VALUE TO THE EXPERIMENTER

By D. W. Thomasson, A.M.Brit.I.R.E.

MANY kinds of television test work can be carried out with the aid of the simpler forms of signal source, such as the "Telesquare," but some faults are only revealed when a fully detailed and correctly proportioned video signal is used. The construction of a generator capable of providing such a signal is not a matter to be undertaken lightly, but the work is extremely interesting, and the cost need not be prohibitive. The most essential requirement is some form of oscilloscope for observing the operation of the various circuits during adjustment, but those who undertake the work will normally possess such an instrument.

In order to cater for as many different individual requirements as possible, the apparatus will be described in such a way that it can be built in several forms. Mains locking can be incorporated without difficulty, or may be omitted, in which case it can be added at a later stage. The original apparatus was designed to produce a synthesised formal pattern (Fig. 1) but it can be used in other ways, and these will be indicated in due course. The timer unit, which produces the basic time marker pulses, is suitable for use in flying-spot scanners and amateur transmitting gear.

General Arrangement

The first step towards drawing an illustration of the standard BBC video waveform on a sheet of paper would be to measure off various horizontal distances on a time scale and so establish the most important time intervals of the signal. This is paralleled in the video signal generator by the action of the timer unit. Four main time markers are needed :

1. 50 c/s. for frame sync pulse control.
2. 450 c/s for horizontal bars of picture.
3. 20,250 c/s for line and half-line pulses. (Line pulses triggered by alternate markers.)
4. 121,500 c/s for vertical bars of picture.

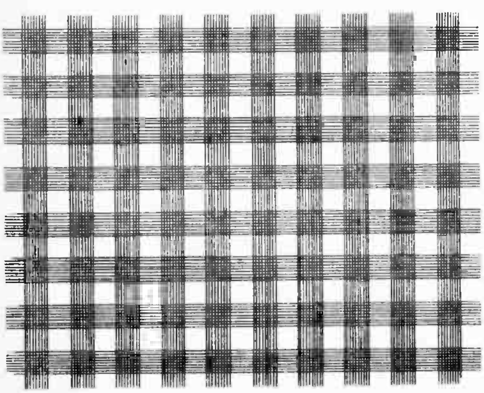


Fig. 1.—Test pattern given by generator.

The actual frequencies are less important than the frequency ratios, which must be exact. The "450 c/s" marker must be precisely nine times the frequency of the "50 c/s" marker, even if the actual frequency of the 50 c/s marker varies, as it will if it is locked to the local mains supply. It has been suggested that this can be achieved by starting at 50 c/s and multiplying in a number of steps until the highest frequency is reached. This is not possible, just as it would be impossible to measure a single time interval of ten seconds precisely with the aid of time marker pips at one minute intervals. It might be possible to obtain nine "450 c/s" pulses for every "50 c/s" pulse, but there would be no guarantee that the higher frequency pulses would be evenly spaced throughout. A little consideration should show the force of this argument.

The time marker pulses must therefore be derived by first generating a 121,500 c/s signal, and then counting the cycles. A 20,250 c/s pulse is required every six cycles, a 450 c/s pulse every 270 cycles, and a 50 c/s pulse every 2,430 cycles. The counting process is carried out in four stages, counting six, five, nine and nine respectively. (The number 405 was chosen for the number of lines per frame because it is equal to 9 x 9 x 5, and fits easily into this process.)

When the marker pulses have been generated, they must be used to form the basic elements of the complete waveform.

The elements are generated in two groups as indicated, and then combined to form the complete waveform. A point which may require comment concerns the frame sync pulses. This term is commonly applied to the "half-line" pulses, which only serve to break up the comparatively long frame sync pulse into shorter pulses for ease of transmission.

All these pulses are derived and combined in the shaper unit.

SYNC GROUP

1. The line pulses: 10 μS long, 10,125 c/s.
2. The frame pulses; 400 μS long, 50 c/s.
3. The half-line pulses; 10 μS long, 20,250 c/s.

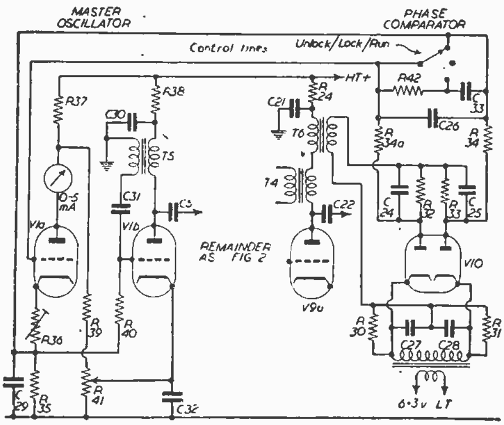


Fig. 3.—Mains locking circuit.

PICTURE GROUP

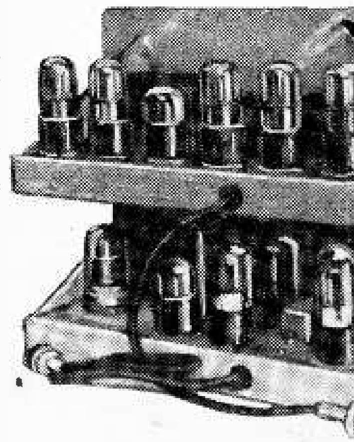
4. The line blanking pulses; 15 μS long, 10,125 c/s.
5. The frame blanking pulses; 1,400 μS long, 50 c/s.
6. The picture vertical bars; $4\frac{1}{2}$ μS 121,500 c/s.
7. The picture horizontal bars; 600 μS, 450 c/s.

Timer Unit

The circuit of a fairly simple form of timer unit is shown in Fig. 2. This circuit does not provide for mains locking, which can be incorporated by making the changes shown in Fig. 3. The simpler circuit uses only three different types of stage: The master oscillator, the cathode followers, and the step counters, and once this point is taken into consideration the operation of the circuit is relatively easy to follow.

The master oscillator must be stable when the 50 c/s markers are not locked to the mains supply waveform, and a Wien Bridge circuit is therefore used with a thermistor to control the amplifier gain and stabilise frequency and output amplitude. If the output voltage increases for any reason the resistance of the thermistor falls, reducing the gain of the amplifier by applying greater negative feedback. A variable resistance can be substituted for the thermistor, the resistance being set so that the circuit just oscillates, but the stability is then much reduced.

The 121,500 c/s signal from the oscillator is fed to the shaper unit by the first cathode follower (V2a) and also to the double diode V3. This acts as a rectifier, building up a charge on C8 a step at a time with each incoming cycle, until the grid voltage of the blocking oscillator V2b rises enough to allow the valve to pass current. Normal blocking action takes place, and C8 is discharged ready for the next count. The circuit therefore produces an output pulse after a given number of input cycles, the number depending on the fixed bias applied to the cathode of the discharge valve V2b. In the first counter, one output pulse is required for every six input pulses, and the bias must be set so that the discharge valve fires on the sixth step.



General rear view of th

The resulting 20,250 c/s marker pulses are fed to the shaper unit by the second cathode follower, V4a, and are also fed to the double-diode V5. The action is as before, but the count here is five, giving an output frequency of 4,050 c/s. This is not used in the shaper unit, the signal being fed directly to the third counter, V6, V7a, which is set for a count of 9, giving 450 c/s pulses. These are fed to the shaper unit by the third cathode follower V7b, and also to the final counter V8, V9a, which is set for a count of 9, and produces 50 c/s pulses.

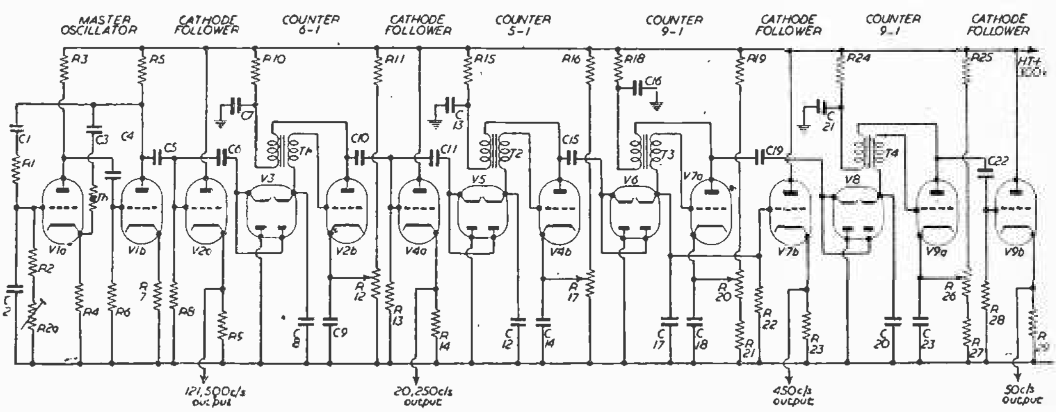
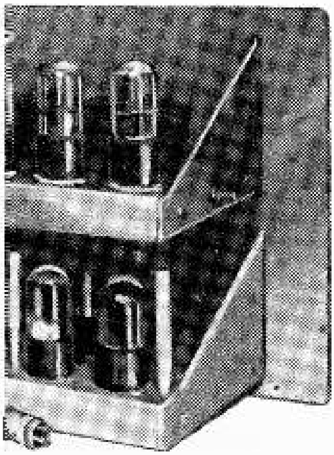


Fig. 2.—Timer unit circuit.

None of the component values in the unit are especially critical, but low leakage is essential in the storage capacitors of the step counters, especially in the last two, and too great a departure from the stated values may lead to difficulty in setting the counter circuits for correct operation. All the transformers are ordinary blocking oscillator transformers, and the original apparatus used the type found in the Loran indicator unit (APN4), which also provides all the valves required. This unit is rather scarce now, unfortunately, and few others are as suitable, but the transformers are no more critical than the other components, and should not be a great problem.



completed generator.

No detailed layout is given, as that must depend to a large extent on the actual components used. The most suitable scheme is to put the five double triodes (all 6SN7s) in a line parallel with the front panel, the transformers in a line at the rear, and the double diodes (all 6H6s) behind or between the transformers. The variable controls then come naturally near the panel.

Mains Locking Circuit

As the signals from the timer unit are all derived from the master oscillator, the frequency of that oscillator must be varied to alter the frequency of the remaining signals for the purpose of mains locking. The method used is to compare the "50 c/s" pulse output with the mains waveform, and derive a D.C. control voltage which can adjust the master oscillator frequency as necessary. The remaining signals then follow automatically.

Before describing the action of the circuit, it may be as well to say a word about the purpose and value of mains locking. The BBC use a very similar technique at Alexandra Palace for synchronising

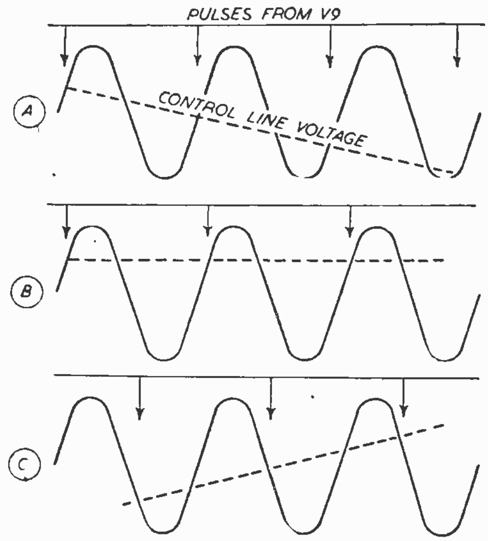


Fig. 4.—Action of phase comparator.

their scanning generators to the local mains and this means that—since a given part of the screen must correspond to a given part of the mains cycle—quite a large amount of hum can be present in the picture signal without objectionable results. For this reason, mains locking is usually considered essential in a video signal generator in order to simulate the transmitted signal properly.

COMPONENTS FOR TIMER UNIT

Components likely to require selection by trial are marked +.

R1—27 KΩ	R9—10KΩ	R18—100 KΩ	R27—4.7 KΩ	R34a—100 KΩ
R2—22 KΩ+	R10—100 KΩ	R19—33 KΩ+	R28—1 MΩ	R35—10 KΩ
R2a—5 KΩ (v)	R11—100 KΩ	R20—10 KΩ (v)	R29—10 KΩ	R36—5 KΩ (v)
R3—47 KΩ	R12—10 KΩ (v)	R21—15 KΩ	R30—100 KΩ	R37—22 KΩ
R4—4.7 KΩ	R13—1 MΩ	R22—1 MΩ	R31—100 KΩ	R38—15 KΩ
R5—47 KΩ	R14—10KΩ	R23—10 KΩ	R32—100 KΩ	R39—10 KΩ
R6—1 MΩ	R15—100 KΩ	R24—100 KΩ	R33—100 KΩ	R40—33 KΩ
R7—3.3 KΩ	R16—100 KΩ	R25—33 KΩ	R34—100 KΩ	R41—25 KΩ
R8—1 MΩ	R17—10 KΩ (v)	R26—10 KΩ (v)		

All ½ watt unless otherwise marked.

C1—50 pF	C8—680 pF+	C15—100 pF	C22—200 pF	C28—0.1 μF
C2—30 pF+	C9—0.1 μF	C16—0.1 μF	C23—0.1 μF	C29—25 μF 25 v w
C3—0.1 μF	C10—100 pF	C17—0.002 μF+	C24—0.1 μF	C30—0.1 μF
C4—500 pF	C11—100 pF	C18—0.1 μF	C25—0.1 μF	C31—50 pF
C5—100 pF	C12—0.001 μF+	C19—100 pF	C26—0.1 μF	C32—0.1 μF
C6—100 pF	C13—0.1 μF	C20—0.004 μF+	C27—0.1 μF	C33—0.1 μF
C7—0.1 μF	C14—0.1 μF	C21—0.1 μF		

Transformers T1 — T6, small blocking oscillator types ; T7, 6.3 v. 50 c/s input, 30 v. output. Valves : All double triodes, 6SN7. All double diodes, 6H6.

Thermistor : Standard Telephones & Cables, Ltd., Type A1522/100.

It must be remembered, however, that all the BBC transmissions derive from the same source, and the signal transmitted from Kirk o' Shotts may be synchronised to the mains supply in London, but not to the mains supply in Scotland. The mains supply throughout the country does keep in step to a remarkable degree, but it wanders now and then, with clearly evident consequences to the television picture, if the set is not free from hum.

On the whole, the biggest and least arguable advantage of mains locking is that it ensures that the generator remains stable within given limits. Without mains locking or some form of comparison it would be quite possible to have the generator operating with the time markers at, say, 145,800 c/s. 24,300 c/s, 540 c/s, and 60c/s. With locking in use the possible deviation is much smaller, especially at off-peak load periods.

The actual amount of extra circuitry required is quite small, as can be seen from Fig. 3. The key point is the double-diode comparator which derives the control signal. Two inputs are fed to this circuit, the 50 c/s pulse from the timing chain, and the local 50 c/s mains supply. The latter is obtained by a small mains transformer working from the 6.3 volt line to give 30 volts between the diode cathodes, and the pulse is applied by a blocking oscillator transformer in the anode lead of the last counter stage. The current flowing through the diodes when the pulse makes their anodes positive builds up a bias on the feed capacitors which ensures that the valves only conduct during the actual pulse, which therefore produces a switching action. During the brief pulse the anodes of the diodes are effectively joined to their respective cathodes, and the voltage between the cathodes is applied to the control lines.

Control Line Filter

The control signal is smoothed to remove any 50 c/s ripple, and is then passed to the control valve, which in turn controls the amount of positive bias applied to the blocking oscillator which now forms the master oscillator. This alters the frequency, a more positive bias increasing frequency and vice versa. The net result is shown in Fig. 4. If the local pulses are at a higher frequency than the mains supply, (a) the voltage on the control lines will fall slightly with every pulse, tending to reduce the oscillator frequency and bring the two 50 c/s signals into step (b). In this condition the control line voltage remains constant until any small drift brings the control into action again. If the pulse wanders too far, it may get on the "wrong" side of the mains cycle (c), producing an inverted action which will quickly move it to the "right" side of the cycle so that normal control can take over again.

The most critical part of the circuit is the control line filter. It is possible to make some sort of compromise so that the filter will remove most of the ripple without slowing down the control response so much that the circuit fails to lock, but it is better to arrange for an additional capacitor which can be switched in once the circuit has locked up properly. The switch is bridged by a resistor which ensures that the capacitor is already charged to the control line voltage. Without this, the addition of the capacitor (uncharged) would upset the control action again. A three-position switch is convenient: in the first position it shorts out the control lines, allowing the unit to work unlocked, in the second it removes that short but leaves the smoothing capacitor connected only by the resistor, and in the last position it shorts out the resistor.

Circuit Adjustment

In constructing the circuit it is as well to avoid putting in the components in the adjustable parts of the circuit too securely, as it may be found helpful to try alternative values here and there. This applies in particular to resistors in series with the variable resistors used for setting up.

The timer unit requires power supplies of 6.3 volts 4½ A., and 300 volts 50 mA. The H.T. current may be appreciably less than this, but will depend on the length of the blocking oscillator pulses. If the pulses are long the valves draw current for a greater fraction of the total time, and the current will be higher. A stabilised H.T. supply is an advantage, but is not essential, especially if mains locking is used.

The first step is to adjust the master oscillator to give an output frequency of slightly more than 100 kc/s. This can be done in several ways, but perhaps the best is to synchronise the oscilloscope time base from the line scan of a television set that is receiving the BBC signal, and set up the master oscillator to give 12 pulses for each line scan pulse. The setting is then exact. When using the mains locking circuit, the switch should be set to the "unlock" position, with the control lines shorted out.

Assuming that the master oscillator frequency has been adjusted by setting R2a or R41 to approximately the correct value, the first counter may be set up. The oscilloscope time base is locked to the 20,250 c/s output, and R12 is adjusted so that the 121,500 c/s. output, fed to the vertical deflection circuit, gives six pulses or cycles to each 20,250 c/s. pulse. A word of caution is necessary here, for adjustment of R12 will cause a wide variation in the triggering frequency of V2b, and it is important to make sure that the oscilloscope time base is correctly synchronised to the 20,250 output. Fortunate owners of double-beam oscilloscopes can put the two signals on the two beams, but others must check by displaying the two signals alternately.

In all the counter stages, the count will be increased by raising the cathode potential, and decreased by lowering it. If, owing to different transformer characteristics, the correct count cannot be obtained, the fixed resistor in series with the control resistor (e.g., R11), should be modified accordingly.

When the 20,250 c/s. output has been set up, the remaining counters are set in turn. There is no normal output at 4,050 c/s., so the connection to the 450 c/s. cathode follower is modified to introduce a proportion of the 4,050 c/s. signal in that output. Locking to the 450 c/s. output, the *third* counter can be set for a 9-1 frequency ratio, by observing the same output on the vertical deflection, and the second counter may then be set up for a count of five by observing the 20,250 c/s. output. Finally, the last counter is set up by locking the time base to the 50 c/s. output and observing the 450 c/s. output.

The oscilloscope time base is then locked to the mains supply, and the 50 c/s. output observed. The 50 c/s. pulse will probably be seen to move across the trace fairly rapidly, and R2a (or R41) must be adjusted until the pulse is stationary. The adjustment should be made slowly, and any sudden change in the motion noted. This sudden change probably means that one

(*Continued on page* 328).

Flyback Line Suppression

METHODS OF ADDING THIS FEATURE TO VARIOUS CIRCUITS

By C. H. Banthorpe

DURING the frame flyback time the signal output level of a television receiver varies between black and "blacker than black" as the level corresponding to the bottom of the sync pulses has been termed.

If the receiver has been properly designed and is operating correctly. the lines which occur during the frame flyback will be suppressed or blacked out. If, however, the receiver fails to reproduce correctly the D.C. component of the signal then these lines will be visible on the C.R.T. as somewhat sloping white lines with fairly wide spacing between them. The effect on a picture is most unpleasant.

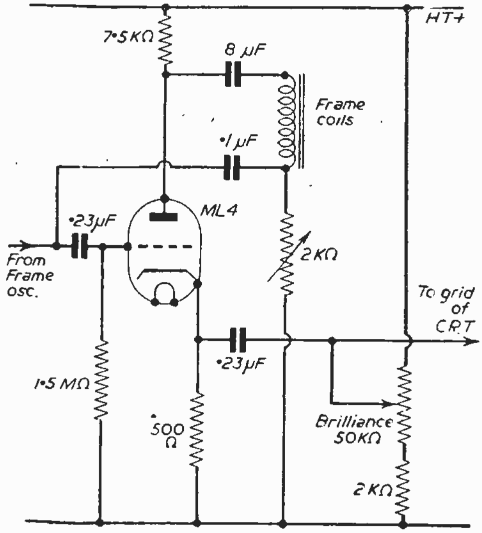


Fig. 1.—One method of feeding the required pulse to the C.R.T.

The lines can also become visible if the brilliance control is too far advanced, or if the receiver is operating with a small input signal, as in fringe areas, or with low pre-detector gain because the sync/picture ratio, normally 30 . 70, will be increased due to the diode detector (and the video output stage if positively driven) operating near the bottom bend of their characteristic curves.

It is possible to prevent the lines becoming visible, even if the brilliance control is incorrectly set or the receiver is working under fringe area conditions, by applying a suitable black-out pulse to the grid or cathode of the picture tube, whichever electrode is not used for picture modulation.

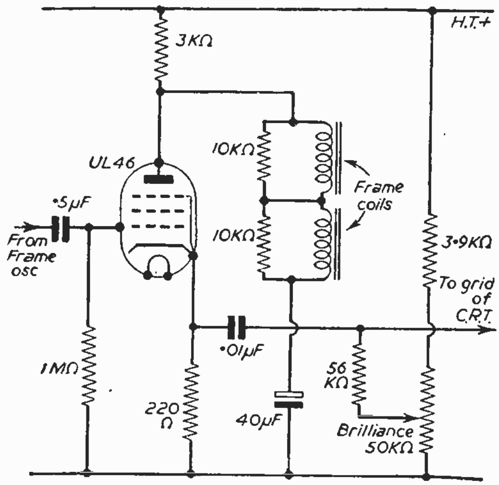


Fig. 2.—Another circuit arrangement.

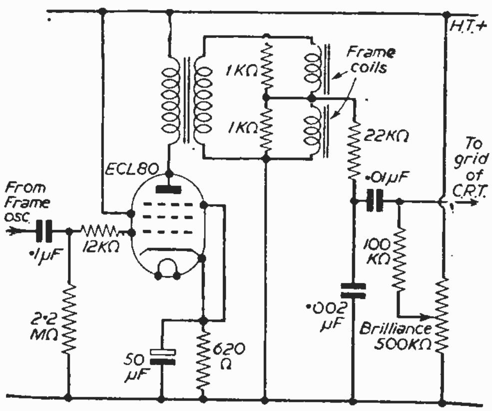


Fig. 3.—Circuit used in Ferguson receivers.

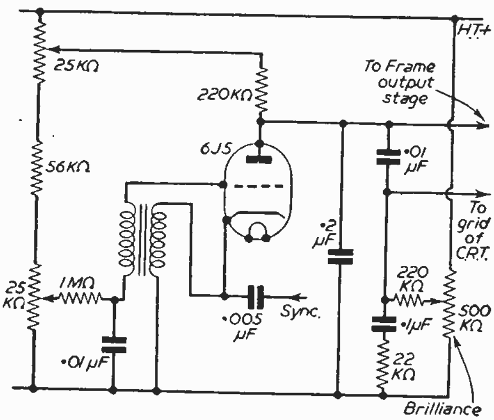


Fig. 4.—This is a McCarthy circuit arrangement.

There are several convenient ways of obtaining a suitable pulse.

If there is sufficient sawtooth voltage at the cathode of the frame output valve this can be differentiated and so made into a suitable shape and

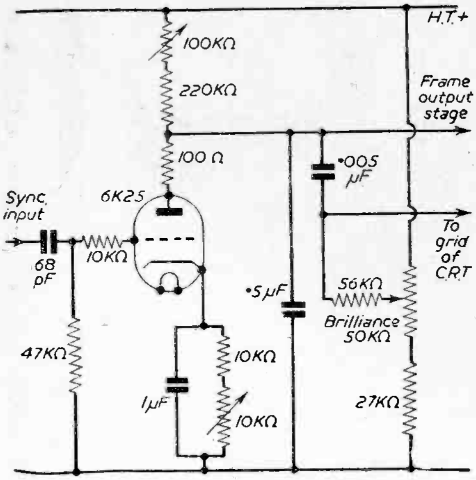


Fig. 5.—Arrangement used in Ultra receivers.

applied to the grid of the C.R.T. This method is shown in Figs. 1 and 2. The first was used in pre-war receivers by H.M.V. and Marconiphone, and the latter is used in a recent Ultra receiver.

Fig. 3 shows a method used by Ferguson's in which a suitable pulse is obtained by differentiating the sawtooth voltage across the frame scanning coils. Because there is some pick-up of voltage from the line scanning coils which, if fed to the grid of the tube, would produce vertical light and dark bands, an R.C. filter is included to cut out the higher frequencies. By earthing one end or the other of the frame scanning coils a positive or negative blanking pulse may be obtained, so this method can be used for

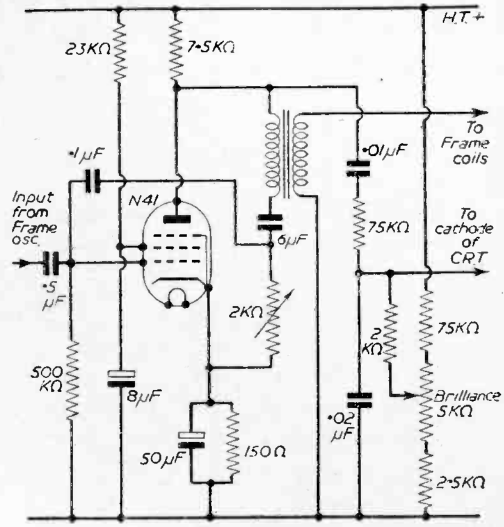


Fig. 6.—This is a Marconiphone arrangement.

either grid or cathode modulation of the tube. Pulses may also be derived by shaping the voltage waveform at the anode of the frame oscillator valve, as in the McCarthy receiver, Fig. 4, or Ultra, Fig. 5, or the anode of the frame output valves as in pre-war H.M.V. and Marconiphone receivers, Fig. 6.

Flyback suppression can be added to practically any type of TV, commercial, amateur, electromagnetic or electrostatic, and it will be found a very worthwhile modification.

"War in the Air"

IN February of this year, the BBC announced the setting up of a small viewing committee, under the chairmanship of Air Chief Marshal Sir Philip Joubert, to advise on the practicability of producing a series of films on the air war, with accent on the European theatre of operations.

The BBC Television Service first approached the War Ministries in 1947 with the idea of producing a considerable series of films about the Second World War, but the circumstances at that time were such that the project had to be dropped. In 1952, the subject was re-opened with Air Ministry, and in February, 1953, work commenced on a series devoted to "War in the Air" to be made with the full co-operation of the Air Ministry and also of the Admiralty, the War Office, the Ministry of Supply and the Central Office of Information. Some 3½ million feet (665 miles) of film drawn from the libraries of the Air Ministry, the Admiralty and the War Office, have already been viewed since that date.

The films will be some 13 in number, each half an hour in length, and they will be televised at weekly intervals during the winter of 1954-55.

A suite of rooms, including a cutting room, has been set aside at Alexandra Palace for the production unit. Members of the unit, working directly under Mr. Philip Dorte, Head of Television Films who is himself a war-time Group Captain, include Mr. John Elliot, producer, ex-Flight-Lieut. Ray Dicks, Senior Film Editor, and ex-W.A.A.F. Section Officer Maureen Taylor, who has been recruited for script research work.

One of the most exacting problems encountered has been the cataloguing and indexing of the enormous amount of available material. Outline scripts have already been agreed with the Air Ministry, and Air Chief Marshal Sir Philip Joubert is acting as technical adviser during the editing, writing and recording stages which will continue throughout the next 12 months.

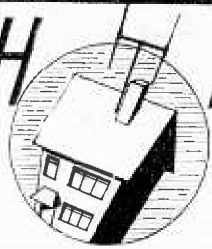
Although the films will give due credit to all the Allied Air Forces and will include much captured enemy material, they will deal mainly with the part played by the British and Commonwealth Air Forces in the last war, and will stress Britain's development as an air power both before and since.

The first film of the series covers the story of the inter-war years from the bombing up of early R.F.C. aircraft, the phase of airships, Hitler Youth Rallies, German Glider clubs, the Schneider Trophy and the Spitfire, to the eve of the Battle of Britain.

Another film deals basically with the Battle of Britain, and the beginning of night attacks on London.

TELEVISION PICK-UPS AND REFLECTIONS

UNDERNEATH THE DIPOLE



By Iconos

THE NEWSREEL LIBRARY

IT seems to me that the BBC newsreel improves week by week. Cautiously, new styles of presentation are tried and occasionally the film editors are able to use selections from the rapidly growing newsreel library of events long past to give point to a current story. The recent BBC Newsreel story on Arnhem was a good example. This is a technique frequently used by the cinema newsreels, though the restricted length of the newsreels places editorial limitations on the scope of the presentation. The BBC have twice as much footage to play with, and yet the TV newsreel is neither slow nor boring. In fact, it is far more satisfying and factual, with greater choice of material than any of the commercial newsreels. The weekly edition, running to a full hour, stands the test of time—which reflects the greatest credit upon Philip Dorté and his colleagues of the Newsreel Department. If the sponsored TV organisers try to produce a newsreel, they will have a lot of leeway to make up, to compete.

THE CRITICS

EVERY form of art seems to have its professional critics whose expressions of opinion have on occasion attracted more attention than the subjects of their critiques. These critics are the men—and women—who shape public taste (or lack of it !) A hundred years ago the so-called intelligentsia anxiously awaited the verdict of Ruskin on architecture, sculpture and painting, and are said to have absorbed his weighty dissertations on the Stones of Venice with literary appetites worthy of that age of three-bottle men. Since almost every activity seems to have attained the dignity of being called an "Art," whether it be concerned with literature, craftsmanship, sport or entertainment, the number of professional critics has multiplied almost *ad infinitum.* Their profession has become a calling. Fifty years ago, the theatre critics of the leading newspapers began to be Very Important People ; they were men whose judgments settled the fate (and livelihoods) of the actors and actor-managers of the very flourishing living theatre of that time.

Newspaper editors made a discovery. They found that quite a large section of their readers were more interested in the "magazine" items in their journals—the articles, the criticisms and even the leaders—than they were in the news. This tendency is even more marked to-day, especially when the critiques concern the entertainments or sports which are witnessed by hundreds of thousands, compared with the odd thousand which managed to crowd into one theatre. Television seems to have eclipsed them all as an item for critical evaluation, since television itself now appeals to such a large and varied cross-section of the public. Moreover, it demands more concentration at the receiving end than sound radio. All of which enhances the interest of the viewer in the opinions of the TV critics. The television critic, therefore, is a power in the land—with the opportunity to take a constructive part in the development of a new "Art"—or, on the other hand, to impress his own personality upon the reader by wisecracks, smart chit-chat or mere mud-slinging.

"RE-TURN IT UP"

AT the moment, professional television critics tend to cultivate a lofty attitude reminiscent of that adopted 15 years ago by the film critics. Then, entertainment values which appealed to the masses clearly did not suit their jaded palates. Documentary was their fetish and great virtue was found in interminable sequences of whirring machinery, fishing nets, pillar-boxes and the ploughman homeward plodding his weary way. This phase is recurring with the TV critics, including the more dangerous type, the guest critics. The latter have little or no knowledge of the medium and use their pens to outsmart the regular TV scribes in decrying any presentation which might be termed "popular." Take, for instance, the critics' reaction to the re-opening of the Shepherd's Bush Empire as the Television Theatre, when "Re-turn It Up" was presented, starring Jimmy Jewel and Ben Warris. The critics were almost unanimous in dubbing it "corny" or "feeble." Yet a very large section of viewers enjoyed this show which did, in fact, give several excellent examples of well-timed comedy cross-talk between the two principal comedians, apart from some fruity "three-handed" sketches. The coffee-stall scene may have been based on the same type of material as used by Laurel and Hardy, Flanagan and Allen or Abbot and Costello—but the treatment was new and, in my house at any rate, had the family circle rocking with laughter. Fay Lenore was a most attractive stooge and Fred Lovelle gave a demonstration of ventriloquism which was original in its presentation and perfect in its technique. Yet it left the TV critics cold ; could it be that they viewed it "cold," carrying out their duties in solitary state ? In this type of entertainment the audience plays its part, and as laughter is infectious, a good time is had by all, including the artistes. Judging a comedian's performance "cold" reminds me of the atmosphere at an audition in an empty music hall, where the manager sat in the stalls alone, in judgment. "You're a comedian, eh ?" he said. "Now make me laugh."

SOLITARY VIEWING

I HAVE the feeling that critics should view all "popular" subjects in company and not in solitary confinement. Perhaps they would then take a broader view of the type of comedy which demands audience participation. For instance, they seem to prefer the whole evening of documentary which was presented a night or so after "Re-Turn It Up"—a debate on International Affairs followed by a long film about dockland. I have a shrewd idea that the pubs and cinemas did a little better on that documentary TV night, heavily patronised by non-viewing viewers! It's an ill wind. . . !

One obviously inexpert guest critic of an evening paper called for a free-hand to be given to Irwin, Lustgarten, Rotha and Duncan Ross—known chiefly as exponents of documentary. If this happens, then competitive television will be doubly welcome. At least that medium will not allocate peak viewing times to this type of item. Documentary has its place in television; it is a vital weapon of propaganda and information. Brevity adds to its force. Let these so-called masters of documentary streamline their work, abandon the old clichés—the whirring wheels, fishing nets and the naïve symbolism, which is every bit as corny as the oldest chestnut cracked in the variety programme. Otherwise, the mission of documentary will fall into the category of being a convenient and reasonably cheap way of filling up programme time.

COLOUR TELEVISION

COLOUR television in the U.S.A. has made another start with new standards which enable colour scenes to be received on colour TV receivers, and at the same time makes it possible for the same transmission to be reproduced satisfactorily in monochrome on black-and-white sets. This is, indeed, an achievement and a friend who recently returned from the States reported very favourably on the results, both on alternative types of colour receiver and on black-and-white sets. The R.C.A. colour receiver includes a tube with three separate electron beams whose possible paths are restricted physically so that the green gun, for instance, can only reproduce green on the tri-coloured reseau of the phosphor surface. More simple are the tubes of the American General Electric and of Chromatic Laboratories, both of which have a single electron beam with a change in beam direction at the front of the tube to provide colour selection. This type of tube is simpler and cheaper to make, but it requires a much more complicated receiver chassis than the R.C.A. type tube. All of these colour systems are based upon the principle that the detail of a colour picture can be traced in monochrome and the colour hues can be superimposed thereon in a relatively coarse manner. In a way, this is rather similar to an early method of printing colour film utilised some years ago by Technicolor. Then, the three primary colours were applied in dye form from three-colour matrices in turn, to a very light black-and-white print. This overcame registration differences and consequent lack of sharpness. Later, the registration of the three matrices was improved, and the black-and-white print base was found to be unnecessary. The same thing might occur in due course on colour TV. TV colour systems which aim at effective reproduction on both colour and black-and-white receivers are termed "compatible," an adjective which will be heard more and more in the coming months. Colour is on the TV horizon.

"H" versus the Multi-element Array

IT can be shown theoretically that a multi-element array has a greater gain than a two-element array. At first sight, therefore, it is thought obvious that this is necessarily the type of aerial to use for fringe reception. Numerous experiments carried out with many different types of commercial aerials under the same conditions, however, showed that in most cases the H-aerial gave considerably better results and was in no case worse than the multi-element types.

The following reasoning is an explanation of this apparent contradiction to theory.

The figure given for the gain of a three-element array is usually about 8 db., whilst that for a $\frac{\lambda}{4}$ spaced H-aerial is well known to be 5 db.; the difference is 3 db. which corresponds to a difference of only 40 per cent. in signal strength which is barely noticeable on the screen. This extra power is very difficult to utilise anyway due to matching difficulties.

It is known that in order to obtain maximum power transfer from the aerial to the receiver, the aerial, feeder and receiver must all have the same impedance. In this country the impedance of the feeder and the input circuit of the receiver is made a value of 70 ohms. Now a three-element array by itself might have an impedance less than 10 ohms; therefore some means has to be used to increase this impedance to 70 ohms. This is attempted by means of folded dipoles, matching transformers, etc., but in practice it is very seldom that the resulting impedance is anything like the ideal pure resistance of 70 ohms. (This often very bad matching can easily account for our 3 db.) Of course, for more than three elements, although the gain is slightly greater, the matching problem is even more difficult.

Feeder

A wide spaced H-aerial, however, has an impedance which is very nearly 70 ohms, therefore no matching device is needed and practically all the power available is transferred. Another consideration is that a commercial three-element array is nearly always fitted with coaxial feeder; it is therefore an unbalanced system which is inferior, as interference can be picked up on the outer braid and find its way into the receiver. An H-aerial using a twin feeder is an almost perfectly balanced system, any interference picked up on one wire of the feeder will be balanced out by an equal amount of interference picked up on the adjacent wire of the feeder and cancels to zero. A further point in the argument is that, even though a multi-element array may be correctly designed it is often erected on a metal pole which must play havoc with the impedance and polar diagram.

The last, but by no means least, consideration to most people is the cost. The cost of a three-element array is about five times that of a two-element array, also the cost of coaxial feeder is about five times that of twin feeder.

Summing up then, it is found that the H-aerial is difficult to beat if installed correctly.

M. R. HARKNETT.

"YOU CAN RELY ON US"

We Offer—

NEW METAL RECTIFIERS

12 v., 2 a., 10/- ; 12 v. 4 a., 14/- ; 6 v. 2 a., 10/- ; 6 v. 4 a., 14/- ; 6 v. Full Wave C.T. 1a, 5/-.

TYANA PENCIL BIT IRONS

200/220 v., 230/250 v., 16/9.

JACKSON SCALES

Caliband, 21/6 ; SL8, 27/6 ; SL5, 26/6 ; Full Vision, 13/- ; Airplane, 13/- ; Squareplane, 12/9.

DRUMS (CORD), 1¼in., 1/3 ; 1¾in., 1/3 ; 2¼in., 1/5.

CHASSIS. Polished Aluminium, 2½in. deep.
6 x 4, 4/6 ; 8 x 6, 6/6 ; 10 x 7, 7/6 ; 12 x 8, 8/6 ; 14 x 8, 10/-.

"SOUNDMASTER"
PARTS STOCKED

"VIEWMASTER"
PARTS STOCKED

AVO UNIVERSAL MINOR, £10.
Model 7, £19.10.
Model 8, £23.

EHT OSCILLATOR COILS
6 to 9 Kv., 39/- ; 8 to 12 Kv., 45/-.
Sub Assembly with U25 Rectifier Fitted
6-9 Kv., 67/6 ; 6-12 Kv., 75/-.

VALVES

6AM6, EF91, 8D3, 8/- each ; 6 for 45/-. 6BW6 (6V6 in miniature), 7/6 ea. 12BE6, 7/- ; 5Z4G, 7/- ; 6X5G, 7/- ; 6AT6 (6Q7 in miniature), 7/6 ; 3A8GT, 5/- ; 6K8G, 9/- ; EF42, 8/6 ; 6V6G, 7/6 ; PEN25, 6/- ; 12K8, 8/- ; 6AG5, 7/- ; IT4, 7/6 ; IR5, 8/6.

WIREWOUND LAB RESISTORS

5 to 7 Watt, 2/3 ; 10 Watt, 2/9. 25, 33, 40, 50, 68, 100, 125, 150, 200, 250, 330, 400, 450, 500, 600, 680, 800, 1K., 1.5 K., 2 K., 2.5 K., 3.3 K., 4 K., 4.5 K., 5 K., 6 K., 6.8 K., 8.2 K., 10 K.

NERA SPOT WOBBLER, COMPLETE, £3.

EHT UNIT, 8-12 K., Variable, Complete, **£6.10.**

Please add Post and Packing 1/- up to £1 ; 1/6 up to £2 ; over £2, Post Free. C.O.D. orders sent over £1.

Write now for
CATALOGUE NO. 12 PRICE 1/-
● 70 PAGES ● 250 ILLUSTRATIONS

RADIO SERVICING CO.

EALing 5737 82 SOUTH EALING ROAD, LONDON, W.5. Next to Sth. Ealing Tube Station.

THE *Radar* **CATHODE TUBE TESTER/REACTIVATOR**

Rapidly and comprehensively checks any tube for Emission, Heater-Cathode Insulation, Inter-Electrode Insulation, etc., without removal from receiver or carton and restores new brightness to tubes in many cases where emission is low or fading. Also tests any component for insulation and resistance up to 50 megohms. An instrument which will quickly earn profits in servicing and the operation of maintenance schemes. **£21 Nett Trade.**

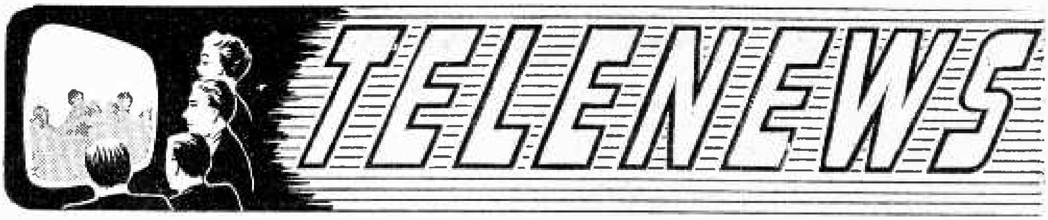
THE *Radar* **KILOVOLTER**
Range 3—30 Kv.

For measurement of line-flyback, R.F. & Pulse E.H.T. Systems. The Radar Kilovolter has been introduced to meet the needs of the service engineer for an inexpensive instrument to measure the E.H.T. voltage applied to the anode of Television picture tubes including the higher voltage used with projection-type tubes.

The Kilovolter consists essentially of a calibrated spark gap and no load is presented at the correct setting.

Safe, reliable and fully guaranteed. **Retail Price £3.17.6.**

waveforms LIMITED RADAR WORKS, TRURO ROAD, LONDON, N.22.
Telephone : Bowes Park 6641-2-3.



Her Majesty at the Show

THE Radio Industry Council has announced that the National Radio Show of Great Britain will be held at Earls Court, London, from August 25 to September 4, with a pre-view for overseas and other special visitors on August 24. It will be organised on the same lines as the very successful show in September, 1953, when the total attendance exceeded 300,000.

Her Majesty The Queen has consented to be patron of the exhibition, this being the first time that the reigning monarch has accepted the patronage. Her Majesty, as Princess Elizabeth, was patron of the Radio Show in 1951, jointly with Queen Mary, who was patron from 1947 until her death this year.

Television Licences

THE following statement shows the approximate number of television licences issued during the year ended September, 1953. The grand total of sound and television licences was £13,090,990.

Region	*Number*
London Postal ...	811,573
Home Counties ...	293,604
Midland	533,128
North Eastern ...	317,757
North Western ...	347,226
South Western ...	97,305
Wales and Border ...	110,404
Total Eng. and Wales	2,510,997
Scotland	98,882
Northern Ireland ...	5,380
Grand Total	2,615,259

Television Relay Service

SOUND relay companies, at present bringing radio programmes to approximately 5,000,000 homes, intend to do the same with television in Northern England and South Wales. Instead of buying expensive receivers, families using this relay service, will have television for a few shillings a week.

The large network will be backed by 200 relay companies.

Humour on Television

RANDOLPH CHURCHILL, writing recently in the TV page of the *Evening Standard*, said that it was apparently an unwritten BBC law that no viewer could possibly appreciate any kind of intelligent humour for more than 10 minutes without a few dancers or guitar players to rest his mind.

Satire and irony, he continued, were not fashionable to-day. Those who were courageous enough to exploit them should not be compelled to have their work diluted.

Italians Pay Now

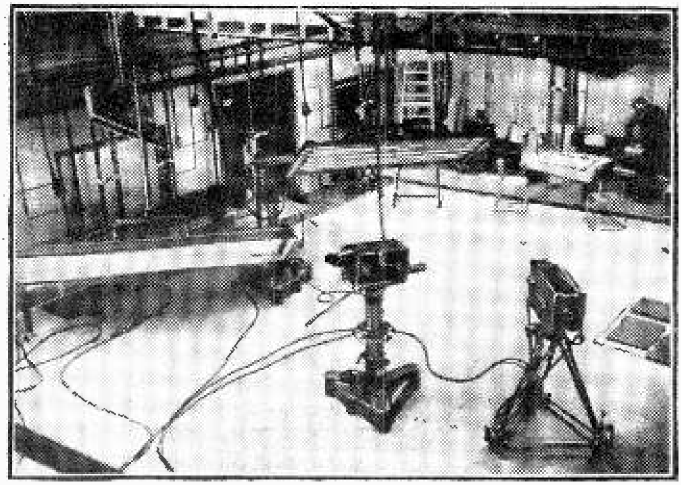
IN Italy, the television licence has been granted free to viewers for the past two years.

As from next year, it is understood, a charge will be made of £8.10s. a licence.

"The Rose and the Ring"

THE children's serial beginning on November 24, will be a new adaptation of Thackeray's "The Rose and the Ring," by Stanley Haynes.

Besides adapting the story, Haynes will be guest producer. Viewers have already seen a number of his drama productions, including "Boy with a Cart" and "The Little Foxes." He wrote the script for "Oliver Twist" and many other films, but this is his first venture in writing or producing for children.



A view of the new TV studio in Brussels which technicians, electricians and painters completed recently, ready for initial tests.

No Pwllheli Site

THE BBC has turned down a proposal from Pwllheli Town Council and radio dealers that the proposed new low-power television station for Wales should be constructed at Pwllheli in preference to Towyn, Merioneth.

In a letter from the BBC to the town council it is pointed out that although a transmitter at Pwllheli would give better reception in that immediate area and as far afield as North Caernarvonshire and parts of Anglesey, viewers in Cardiganshire would suffer. In addition, many sets in North Caernarvonshire are able to receive pictures from the Holme Moss transmitter.

For the Price of One Car

A CAR-SELLING firm in Canada is advertising in the newspapers its "sensational offer of a free television set, Admiral 17in. screen, new 1954 model" to any buyer of one of its new or old cars, including British models.

Rugby Questionnaire

WELSH Rugby clubs have been sent a five-point questionnaire, in conjunction with the televising of four first-class matches later this season.

The questions asked clubs are: Do you favour the "live" televising of internationals on Saturdays? If so, how many in one season? Would you like such transmissions to be restricted, e.g., to the second half only? Are you in favour of following up the "live" broadcast with a film of the match a few days later? Or, are you in favour of the film only?

Replies to these questions must be sent to the Welsh Rugby Union by early in February. Meanwhile, union officials will watch the televised matches with keen interest to see how much attendances are affected.

Football from Europe

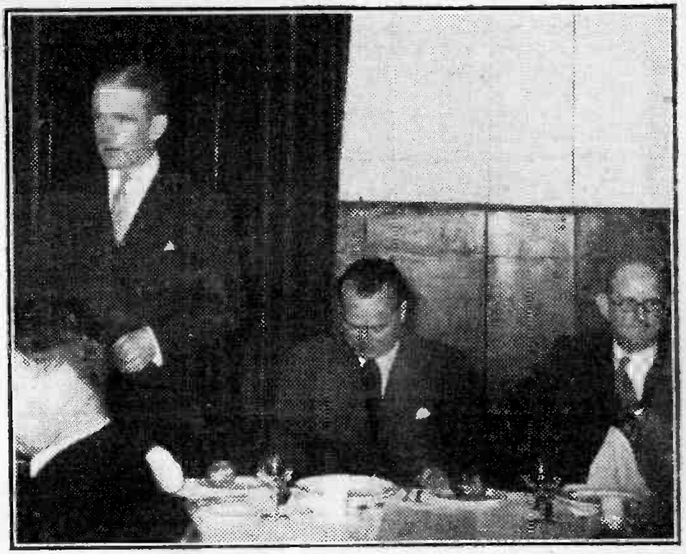
IN order that the European football championships may be televised from Berne, Switzerland, in June of next year, the Swiss broadcasting authorities have placed an order with Marconi's Wireless Telegraph Co., Ltd., for a complete outside broadcasting vehicle, to be delivered within nine months.

The series will not be transmitted merely from the small Zurich experimental station, but on a link-up involving several European countries that have a footballing interest in the games.

Delivery by 'Plane

EACH week hundreds of television sets are being flown by aeroplane from manufacturers in this country to buyers on the Continent where the demand is rapidly on the increase.

Orders are pouring in from Scandinavia, France, Switzerland and the Low Countries as more and more networks are completed and there has been a big television "boom" in Germany where stations have already been set up.



Mr. Norman Collins addressing members of the Publishers Publicity Circle in secret session on the subject of sponsored TV and books. On the extreme right is Mr. F. J. Camm, editor of "Practical Television."

Suppliers are finding that direct delivery by air is a great timesaver that eliminates many of the complications that arise with ground transport.

Scottish Chief

THE new position of Television Organiser, Scotland, has been given to Mr. George Runcie, who was at one time with Aberdeen Journals, Ltd.

He joined the BBC in April, 1947, as a news assistant and was appointed Talks Producer, Scotland, six months later. He has produced many important discussion series on the air, one of the most popular being "A Matter of Opinion."

Courting Venue Changes

SPEAKING at a Perth Congress recently, Prof. T. G. Fergusson said that television was tending to take courting couples from the back row of the cinema balcony to the drawing-room sofa, just as the advent of the cinema had had the adverse effect.

"The introduction of movies," he said, "which at first sight was remote from personal relationships, led to a change in the courtship habits of the western world."

Isle of Man Booster

THE BBC has applied to the Air Ministry for permission to erect the Isle of Man booster aerial at the Ministry buildings on Snaefell and has already advertised for staff to operate the station.

Use in Schools

LOCAL authorities in Yorkshire have been sent a circular letter by the Association of Education Committees inviting opinions on the subject of introducing lessons by television in schools.

Baird's Memorial

OFFICIALS of the Wembley History Society are afraid that if they repair the memorial to John Logie Baird, which was erected in the grounds of Kingsbury Manor, Middlesex, several months ago, vandals may smash it for a fourth time.

Three times in as many months it has been found lying, badly chipped, on its back, broken by unknown hooligans.

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).

STUDIO LIGHTING

SIR,—Apropos the subject of studio lighting I am in complete agreement with Cecil Harper in the October issue.

It would seem that, while the designers of equipment have been doing their utmost to improve the definition, contrast and brightness of the picture as presented to the viewer, the BBC has been going the other way and giving the Bloomsbury boys and their "arty crafty" ideas full rein.

After three years of viewing it seems to me that the general light level is, at present, one of the greatest weaknesses of the television system. If this point is agreed then it follows that any subject matter for transmission which requires a low level of lighting must be labelled as unsuitable material. It strikes me that the BBC is completely ignoring this point and judging the matter from the effect, on the spot, in the studio.

However, as regards making pleas to the BBC, I think this is quite useless. The question of what Mr. Harper, or any other viewer for that matter, wants does not enter into it. We are not going to get what we want, but what they, the BBC, think we ought to have. Furthermore, the BBC is going to do its best to see that no one else is allowed to give us what we want if its attitude to commercial TV is to be taken as a guide.—I. D. MOTTRAM (Aylesbury).

SIR,—With regard to Mr. Cecil Harper's "plea" to the BBC *re* the stage lighting, and the effect on his old C.R.T., it seems to me that it falls into line with the dear old lady who, on one occasion, rang up the BBC and asked them if the symphony orchestra could play a bit louder, because the H.T. battery on her set was running down!—W. A. STEELE (Smethwick).

VALVE DEFECTS

SIR,—While offering my compliments to Mr. Gordon King on a most excellent article, I feel your readers' attention should be drawn to a most frequent fault and one likely to cause them a great deal of trouble. Likely symptoms: normal flyback whistle, no E.H.T., no sign of heater glow. (In most cases the reader will check heater for continuity only to find apparently all is well.)

Fault: Some of the miniature type E.H.T. rectifiers, on switching on, will back-arc in such a manner that a small hole is drilled in the glass thus destroying the vacuum.

Correct procedure: Always check with a battery before installing to see that the heater glows and again if the above symptom occurs.

Winding on transformer must, of course, be unsoldered on one side of rectifier if valve is installed.—A. S. T. (London).

[*Although of an unusual nature, this is a valve defect, and will immediately be revealed on checking for pulse voltage at the* **anode**. *A valve going "down to air" in this way has not been known by us, in spite of replacing many hundreds of miniature type E.H.T. rectifiers. An effect of a similar nature has been known to occur in a line output valve, where a flashover through the glass envelope was provoked from the E.H.T. cable, which had welded itself to the glass, to the valve anode. The E.H.T. cable inadvertently positioned close to the envelope of an E.H.T. rectifier may give rise to a flashover through the glass to the valve anode, to result in the effect described. We cannot, however, see how a flashover within the valve could cause the effect.*—EDITOR.]

ADMIRALTY PATTERN 4790B, RESPONSER UNIT, DESIGN A.

SIR,—This unit would appear to be all that the VCR97 fan could require for a complete vision receiver, and as I have not seen it mentioned in your excellent publication I thought perhaps many amateurs may have been put off by the description as a "responser unit."

Line-up as follows: VR136, HF, EA50, mixer, VR137 osc. 5 stages, VR65, IF, EA50, DET, VR65, video amplifier.

The only modifications necessary: 1. Disconnect H.T. lead to relay and connect direct to panel; 2. Add 3 off 0-30 pF variable condensers, one across each of the six-turn coils and I.F.'s on Wenvoe's frequency; 3. Remove small variable condenser from plate of oscillator to relay.

This set has ample power for fringe areas and gives far better results than R.F. units + 1355 and is cheaper. I would suggest it is just what many have been looking for.

All three coils are tuneable with brass slugs and the contrast controls the first three I.F. stages.

I feel that a short article on this set would be more than appreciated. Thank you indeed for the really interesting and practical articles in your paper.—F. C. PENFOUND (Patchway).

TV A MENACE?

SIR,—Your correspondent, V. B. Richards, is probably right about the people who have forsaken their local cinemas in favour of television at home. Perhaps one reason is that they are tired of the sensational approach, sometimes vulgar, that competitive enterprise has always considered necessary in the make-up of a cinema show. That soon there may be little need for anyone to go out for entertainment seems likely, but they will always do so.

Churchgoers who could have had their services at home by radio for many years now, seek the atmosphere of a holy place as well, and music lovers still go to concerts in spite of their high-fidelity amplifiers. After all, the housewife with a telephone need rarely go out, but the streets still seem full of shoppers.

The communal instinct must always prevail if life is to run a natural course. The people who really enjoy an entertainment are those in the audience lending visible support, and not the remote TV addicts in their thousands, overwhelmed by its novelty, who will one day find they are lonely.—E. R. VEATER, A.M.I.P.R.E. (Hayle).

RADIO INTERFERENCE

SIR,—Radio interference from nearby TV sets is a problem usually passed on to the Post Office, who do not seem to have much success with this trouble. My job with a local radio and TV dealer brings me into contact with many customers' complaints. The Post Office engineers' advice to the radio owner, such as move the set or the aerial to a different location, does not cure the trouble. I suffer from this interference myself and cannot effect a cure. The old type wave trap gives a small degree of suppression but is nowhere near sharp enough, long wave tuning being rather broad even in a superhet circuit. As the offending radiation comes from the timebase oscillator in most TV sets it must somehow get back to the aerial, as I don't think a direct radiation from the set would carry very far. I think the chance of the interference being mains-borne can be ruled out by experiments I have made in this direction. I have the normal " L " type outdoor aerial 30ft. high and a 15ft. rod type, also indoor aerials used with three superhet receivers, one with pre-hf. stage, but I confess to be beaten by this trouble. I shall be very grateful for any suggestions readers may offer. Some reader may have overcome this interference and will come to my aid.—F. V. TRENT (Bognor Regis).

Test Gear

SIR,—I would like to endorse the request of Mr. A. J. Walton in your correspondence column in the October issue.

Would it be possible to include a field strength meter or comparator to measure or compare TV sound and interference in different locations?

My visit to the Radio Show brought to my notice the great improvement in picture quality resulting from (a) projection TV and (b) direct vision with spot wobble. I am sure a very large number of readers are with me in asking you to describe the construction of a set in either category.

A comprehensive article on TV aerials giving performance data and dimensions in tabulated form would also be a great help, with details of flexible (folded dipole) loft aerials which are so popular. —S. N. EDWARDS (Bournemouth).

[*A comment on " H " versus multi-arrays appears on page 320. What types of ancillary equipment do other readers feel would be popular as constructional features?*—EDITOR.]

Standardisation of Controls

SIR,—I have a Philips projection model which gives me what I consider to be a good picture. The four control knobs, brightness, contrast, volume and focus, enable me to alter it in any way I please and thus it is very rarely that I receive a signal with which I cannot " fiddle " until a suitable picture is obtained.

Recently, however, my friend bought a 17in. screen set which has only a volume on/off and a brightness control. When he first invited my wife and I to give our verdict on its receiving qualities, I noticed immediately that the picture had too much black and white and told my friend to turn down the contrast knob and increase the brilliance very slightly. When I learnt that the receiver, a very expensive one, possessed no contrast control, I was baffled. The brightness, when increased helped a little but my friend was unable to perform any other form of modification and had to put up with a too black screen.

Surely there should be some form of standardisation concerning controls between commercial firms in designing television receivers.—P. B. BARR (Catford).

VIDEO SIGNAL GENERATOR

(*Continued from page* 314.)

of the counters has moved to a new counting ratio and it must be checked and reset before completing the adjustment. It should be possible to swing the 50 c/s. output over a reasonable range on either side of the mains frequency without losing the correct count. In the free-running version the 50 c/s. output should be set to synchronise with the mains, and checked periodically. (A magic eye used as a frequency comparator is a useful refinement, but mains locking is even better.)

Adjusting the Mains Locking

When using the mains locking circuit, the procedure is exactly as described above, the locking circuit being switched out during all the foregoing adjustments. In this case it is especially important to check that the count holds properly for a reasonable range above and below mains frequency, or the locking will not work.

The first step in setting up this part of the circuit is to adjust R36 to give a mid-scale reading on the 0-5 mA. meter. This meter, by the way, need not be calibrated, and need not be exactly 5 mA. F.S.D., as it is simply used to indicate the operation of the locking circuit. Some such indication is essential.

The locking switch may now be opened, and the circuit should lock in phase with the mains, this being shown by a sudden flick of the meter needle, followed by a steady reading. This reading should be as near the original centre setting as possible, and adjustment of R41 should give this condition. The locking switch may now be moved to the last position (" run ") and the steady meter reading should be maintained.

Successful setting of the timer unit requires quite a lot of patience, but if it is carefully done little alteration should be needed during subsequent operation. It will be found that there is quite a range of adjustment on most controls which will give the correct result, and the control should be set in the middle of this range. On first switching the unit on the circuit may refuse to lock, but a few minutes' run will warm things up and restore the original settings. Until the circuit has locked in, and the meter is steady, the selector switch should be kept in the " lock " position.

Using the Timer Unit

The timer unit is normally used with the shaper unit as already described, but it can be put to other uses, and a note of these may be of interest. One of the most surprising applications is to drive the time bases of a television receiver in an extreme fringe area. The normal synchronising circuits are disconnected, and the 20,250 c/s and 50 c/s outputs are used to control the receiver time bases. In order to obtain the correct phase for the line scan a very fine control of the oscillator frequency setting is necessary, and this will require frequent adjustment, but a picture can be held. For this use, it would be best to leave out the first counter stage and its associated cathode follower, modifying the master oscillator to work at 20,250 c/s.

The timer unit can also be used to drive the time bases of an amateur transmitter or a flying spot scanner. In the latter, a transparency is illuminated by the light from a suitable cathode-ray tube on which a raster is displayed.

(*To be continued.*)

YOUR Problems SOLVED

Whilst we are always pleased to assist readers with their technical difficulties, we regret that we are unable to supply diagrams or provide instructions for modifying surplus equipment. We cannot supply alternative details for constructional articles which appear in these pages. WE CANNOT UNDERTAKE TO ANSWER QUERIES OVER THE TELEPHONE. The coupon from p. 335 must be attached to all Queries, and if a postal reply is required a stamped and addressed envelope must be enclosed.

POWER SUPPLY DIFFICULTY

I have a Pye LV21C television, purchased 3 years ago. After 2½ years TMC R.M.3 rectifier blew top fuse. I checked reservoir and mains input capacitors—O.K. Put in new rectifier, 8 months later same trouble. Sent capacitors to be tested—this time O.K. Put in another rectifier last week—picture and sound perfect. I have checked resistors in circuit. Can you tell me where else to look for trouble ?—F. J. Summers (Perth).

Although the electrolytic capacitors associated with the mains smoothing system in your receiver appear up to standard on test, it is possible that they flash over when working under normal conditions. Replacing the relevant capacitors will probably solve your problems and save you the expense of frequent rectifier relacement. It has been found advantageous to employ the larger type rectifier (RM4) in your model receiver.

PHILIPS MODEL 383A/15

Just recently a fault has developed in the contrast control of my Philips television, model 383A/15. I have removed the potentiometer, cleaned it with carbon tetrachloride and replaced it, without any noticeable improvement. I would have fitted a new potentiometer, but on testing the old one I thought that the resistance was very high—about 750,000 ohms. Could you please advise as to the value of potentiometer as a replacement ?—C. G. Brown (Chislehampton).

The value of contrast control in your model receiver is 500,000 ohms.

ARGUS SIGNAL STRENGTH

I have built the Argus, but I am having a few snags.

(1) With the aerial disconnected there is a slight bounce of raster.

(2) The flyback lines appear to be pairing.

(3) When receiving the picture the flyback lines very often show across the picture. (I have to run the set with contrast control turned to its maximum position, otherwise the picture is too indistinct.)

(4) The set requires to be stopped from rolling occasionally with line control.—L. V. Gregson (Glasgow, E.1).

The slight " bounce " to the raster when the aerial is disconnected is of no importance and can be neglected.

You are obviously not getting sufficient signal strength. To improve the signal check that each vision coil peaks to the vision signal. Add or take off a turn from any coil which does not peak and you will thus be able to overcome stray wiring capacitances.

Further increase in signal can be obtained by connecting a 50 μF 25v. working condenser across the cathode resistor of the video valve.

VIEWMASTER

I have completed this receiver, and apart from two obvious faults am getting a very good picture. If you can help me remove these faults, I would be much obliged.

I am using a 12in. Brimar tube C12B and have made all modifications as per handbook, but removed the 1 megohm resister from R46 as this caused a vertical line.

I find that I still get three faint vertical lines in the left half of the picture, which are more noticeable on some pictures, the lines being about an inch apart.

Secondly, I get a bright line along the bottom of the picture about ¼in. wide.

I notice, too, that the lines on the clock test card are longer on the left side of the clock than the right.—C. Hawling (West Kirby).

To reduce the effect of the bright vertical lines on the left of the picture, it is only necessary to increase slightly the value of R46, the best way of doing this being to connect a variable resistor in series with it. We suggest, therefore, reducing the value of R46 to 47 KΩ and connecting a .1 MΩ variable resistor in series with it, which should then be adjusted for best linearity.

The distortion at the bottom of the frame is possibly due to R66 being wrong value, though similar effects may be obtained if C51 is low capacity or disconnected, also if V12 is at fault, or if the frame transformer or scanning coils are faulty or wrong type.

MAINS TAPPING

I have a T.161 Ekco television. I am having the following fault detailed as far as possible as below :

No picture ; horizontal lines with wave slightly moving up and down ; remote times picture is seen ; frame and line-controls will not minimise this. I have had the set for two years.

To overcome this I have to remove tapping of 230/250 volts to 200/210 volts, the set then runs O.K. Is this dangerous ? The main supply should be 240 volts. —L. Hayden (Greenford).

It is, indeed, dangerous to work your receiver on a lower voltage mains input tapping as a method of counteracting a defect. Your remarks indicate that under normal conditions the receiver's H.T. line potential is low. This may be due to low emission of the mains rectifier, the U801 valve or sometimes one of the 50-ohm limiting resistors, in series with two anodes of the rectifier, goes open circuit to give rise to similar symptoms. Check the emission of the valves associated with the vision section generally, and ensure that the H.T. line potential is up to standard : 240 volts should be present at the cathode of the mains rectifier.

SYNC FAULT

I have a 12in. console model Ferguson television receiver, model 983T. For the last two months I have had trouble with the picture, the top half of it quivers, the vertical lines running from top to bottom are all bent.

I have changed the ECL80 valves around, also the EF80, but it does not make any difference. Could you give me some idea where to look next? I have also tried to get it right with the four knobs at the back: horizontal hold, contrast, vertical hold and picture height—with no success.—G. W. Butler (Plumstead).

This may be due to a defect in the sync separator section. Check the valve concerned—the pentode section of the ECL80 located to the right-hand side of the deflector coils, adjacent to the PY82, viewing from the rear of the chassis—and also the associated components, particularly the 0.1 μF capacitor, connected from the control-grid of the pentode section (pin number 9) to a 12,000-ohm resistor returned to the anode of the video amplifier.

A symptom of similar nature sometimes results due to a defect in the crystal vision detector; this is a crystal diode type CG5 located in the screening can of the final vision I.F. transformer.

VIEWMASTER W.A. TUBES

I recently altered my Viewmaster to wide angle scanning as per your reprint of October, 1952. I am using Mullard MW 43/64 17in. tube, and while I receive an excellent picture I have been unable to get the time bases to lock as they did previously with the old set. Both the frame and line time bases give trouble —the frame is difficult to lock and at the end of say a play when the announcer comes on, the picture begins to slip—the line time base also is very touchy and only holds for half an hour or so at a time, the picture tearing badly, sometimes at top and sometimes at bottom. I have substituted everything except the frame transformer and line transformer also the scanning coils without any improvement. Do you consider to change over to the "Allen" time base circuit would improve matters?—W. G. McFarlane (Glasgow, N.W.)

None of the modifications to the use of wide angle tubes will affect the synchronising of the time bases, and it must be, therefore, that in modifying the receiver you have either disturbed the alignment or there has been a change in the value of R21 in which case it requires to be replaced.

BRIGHTNESS CIRCUIT FAULT

I would be grateful if you could assist me in locating a fault in my Ferguson TV receiver, type 984T. The fault is in the vision section, as sound is quite okay. With aerial disconnected and brilliance at minimum, the raster is very bright with heavy fly-back lines. As the brilliance is turned to maximum, the raster goes dimmer, and when the control is at maximum, the tube blacks out for a short while, when the raster then shows faintly and then fades again, etc. With the aerial connected the fault is just the same, except that when the brilliance is at minimum (when the raster is bright), a very faint picture can be seen, and (although I am not sure of this) it seems to be a negative picture.—L. E. F. Burdett (Leeds 6.)

This symptom may be the result of an open circuit in the brightness control network — suspect brightness control potentiometer; a heater to cathode short in the picture-tube; low anode volts on the video amplifier—check the anode load resistor, 3,000 ohms, associated with this valve; or a defective component in the video amplifier biasing line—check the associated electrolytic capacitors.

FAULTY COMPONENT

My "Argus" television has been functioning well for eighteen months. Recently I built a new vision receiver (according to specification). This gives a good picture showing no obvious defects when receiving Test Card C, and having a bandwidth of 2 Mc/s clearly defined. Shortly after this the frame hold ceased to function, the picture rolling upwards and fly-back lines showing. I have replaced all the components associated with V17, including the valve and potentiometers. Also (R50, 51, 74, 39, 40) and (C60, 59). I have rewired and replaced components associated with V13, and V14, including the valves. I have also checked V12 and substituted new components. The frame hold is still, however, too critical for viewing. Reducing R35 to 60 KΩ makes the frame hold a little more stable, but results in a "wavy" picture. I have tried connecting a 32 μF condenser across various parts of the H.T. line and checked the power pack condenser for shorts. I have also replaced C40. The sound section is good.

Can you please make any further suggestions?—D. Norman (Ickenham.)

One point which must not be forgotten in your search for the fault is that it is possible to have replaced a faulty component with another faulty component.

Where frame hold is difficult after having functioned well previously, then the frame oscillator should be the first point to be tackled. Check the potentiometer VR5 for partial framing through the spindle to chassis, and also VR6 and C46.

Ensure that the output of the sync separator is not being affected by the line circuit, by disconnecting C58 on the V14 anode side.

C40 should be checked together with R33. The video valve itself should be checked together with the anode and cathode components. Faulty time constants in the output of the video valve, or faulty time constants of the cathode circuit will cause trouble of this nature.

Try varying values of C26.

WINDSCREEN WIPER INTERFERENCE

I operate my set, a Pye FV1, on a much used road in a difficult area, and have hardly any ignition interference, but as soon as it commences to rain, reception is practically ruined. When over 100yds. away the wipers cause white dots, then the frame hold slips, and finally the picture is blotted out. A high pitched whine varying in pitch with the sweep of the wiper is heard on the sound.

I wonder if any of your readers have similar trouble or am I an isolated case? Buses, which have no electrical ignition, are my main offenders; there are over four routes passing our house.—J. Aspin (Darwen.)

Windscreen-wiper interference is partially limited by suppressor circuits embodied in your receiver. These, however, are primarily designed to suppress impulsive interference of the type characteristic to car ignition systems. Main road television reception is usually limited by virtue of impulsive interference—the ratio of motor interference being very small.

It therefore appears that interference may be reaching the receiver by way of the aerial feeder. A good quality *screened* twin-feeder is to be preferred on main road locations, resulting in a marked improvement of signal to interference ratio. New vehicles are to be suppressed throughout—including the windscreen wiper.

"VIEWMASTER" Valves, exact to specification, guaranteed new and boxed, comprising 5 EF50, 1 6P28, 1 KT61, 1 EBC33, 1 EB91, 2 6K25, 1 6P25, set of 12, **£6/2/6** (post and insurance 2/-); "Tele-King" 16in. Receiver, complete set of 17 valves exact to specification, **£9/9/-**; 6AM6, EF91, 6F12, Z77, 8D3, 6C4, L77, W77, EF92, 6AM5, EL91, 12AX7, **7/9**; any 8 for **56/-**; EB91, 6AL5, HVR2A, **6/9**; 1.4v. miniatures, 1S5, 1R5, 1T4, 3V4, 1L4, 3A4, **7/6**; 3S4, **8/6**; any 4 for **27/6**; CV6G, 6V6GT, 6F6G, KT63, Y63, 1C5GT, DL35, EF39, EBC33, EF50, 20D1, 7B7, 7C5, 7H7, 7S7, **7/6**; 5Z4G, 5U4G, 5Y3G, MU14, 7Y4, 7C6, U22, U78, DH77, 6AT6, 12AT7, ECC81, 6X4, 6BA6, 6BE6, 6BW6, 6J6, EC91, Pen46, PY82, 6LD20, 6X5GT, **8/6**; EL38, PL38, **22/6**; PZ30, GZ32, 6U4GT, **17/-**; DK32, 1A7GT., 6P25, N78, **15/-**; UU8, U25, **13/6**; U16, EAC91, ECC91, 6A7, UBF80, PL83, 6F1, 6F14, 1H5GT, DAC32, 1N5GT, DF33, 3Q5GT, DL33, **12/-**; PL81, PL82, PY81, ECH42, UCH42, UL41, X65, 10F9, 10LD11, 10C1, 10C2, **11/-**; ECL80, EF80, EY51, PY80, 6F15, 6C9, 10F1, 10P13, CY31, 43, KT33C, 6A8G, 6K8GT, 12K8GT, EAF42, R10, **10/6**; 25Z5, 25Z6GT, EBC41, UBC41, UF41, **10/-**; 6SN7GT, 6SL7GT, 6Q7GT, 12Q7GT, 12J7GT, 12K7GT, 25Z4G, 25A6G, EF41, **9/6**; 6K8G, U50, 5Y3GT, 25L6GT, 35L6GT, 50L6GT, 35Z4GT, 80, UU9, U404, UY41, EZ40, **9/-**; 6K7G, 6K7GT, EF8, **6/-**; all new and boxed, postage 4d. per valve extra. READERS RADIO, 24, Colberg Place, Stamford Hill, London, N.16. (STA 4587.)

SPEND A SATURDAY in our Walk Round Radio Store among friends. Everything priced and laid out for your inspection. You will not be pressed to purchase. You can then: hear your speaker play; note our selection of tools especially selected for radio; keep abreast of the latest radio components. Or if you are too far away, write for our free list. SERVIO RADIO, 156/158, Merton Rd., Wimbledon, S.W.19. Nearest Tube: Sth. Wim.; 92 bus passes door. (LIBerty 6525.)

ARGUS CHASSIS, 30/-; VCR97, **20/-**; Haynes EHT, 6kV, **40/-**; Haynes Scan Coils, **20/-**; 12 EF50s, **24/-**; 3 RM3s, **7/6**; CRM92, **£7**; R.S.C. Mains Trans., 350-350, 2, 4, 6v, 100 ma. Drop Thru, **15/-**; 2 Pencil EHTs, 1,000v, **10/-**. (F) FULLER, 149, Lichfield Road, Gt. Yarmouth.

NEW VALVES WANTED, small or large quantities, 3Q4, 6V6, 5Z4, ECL80, EF80, TP25, PY82, KT61, 6L6N, VR150/30, 5R4, 80, etc., etc. Prompt cash. WM. CARVIS, 103, North Street, Leeds, 7.

DO IT YOURSELF THE DERWENT WAY
44-page illustrated Booklet for Handymen.
Read about **Formica; Tileboard; making TV Cabinets and Tables; making Seagrass Stools; French Polishing,** and where to buy materials. From your Newsagent, price 6d., or 8d. by **Postal Order** from the publishers:
DERWENT CRAFTS Bridge Gate, Derby.

James H. Martin & Co. for

"VIEWMASTER," "TELEKING," "SOUNDMASTER," "TRUVOX TAPE DESKS," Components, Valves, Cabinets, etc.

Mail Order ONLY, Easy Terms available.

FINSTHWAITE, NEWBY BRIDGE, ULVERSTON, LANCS.

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

RADIO UNLIMITED offer brand new valves and components. Viewmaster, set of 12, as specified, **£6/2/6**; 1T4, 1R5, 1S5, 3S4, **28/-** set; 5Z4, 6V6, 6K7, 6K8, 6Q7, **35/-** set; 12K7, 12K8, 12Q7, 35L6, 35Z4, **39/6** set; EF91, **6/6**; EB91, **6/6**; EF50, **6/6**; 6F6, **6/9**; SP61, **4/6**; SP41, **4/6**. 13,000 valves actually in stock; stamp list. "Viewmaster" Coils, **17/6** set, incl. choke; Viewmaster Transformers: Filament **35/-**, Line/Out **29/6**, Frame **15/9**, Choke **15/6**; C.R.T. isolation, 6v at 2 amps, **18/6**; Heater Trans., 6.3v at 1.5 amps, **5/9**; ditto, tapped at 2v and 4v, **6/6**; Co-axial Cable, **8/6** doz. yds., any length to 100yds. RADIO UNLIMITED, Elm Road, London, E.17. (KEY. 4813.)

BOOKLETS: "How to use ex-Gov. Lenses and Prisms." Nos. 1 and 2, price **2/6**. Ex-Gov. Optical lists free for s.a.e. H. ENGLISH, Rayleigh Road, Hutton, Brentwood, Essex.

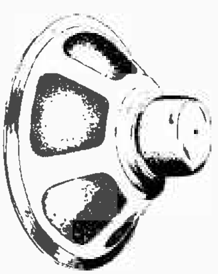
50 SECONDHAND Televisions always for sale; famous makes. TOMLINS, 127, Brockley Rise, Forest Hill, S.E.23. (FOR 5497.)

P.T. ARGUS T.V., Wenvoe: owner invested larger screen; spare tube, etc., enlarger; fault in T.B. Offers? Box No. 158, c/o PRACTICAL TELEVISION.

T.V.—All the latest Coilsets or Components; Hi Fi; new FM Receivers; daily demonstrations. (Ring ARC. 5078.) B.S.P. CO., Marlborough Yard, N.19.

"DIRECT T/V REPLACEMENTS" enables you to purchase all your components, valves and T/V books from one supplier. Largest stock of manufacturers' and home constructors' components. Spares Manual and Supplement, **9d.** 134-136, Lewisham Way, New Cross, S.E.14. (TIDeway 2330 and 3696.)

LOUDSPEAKERS



10" P.M. moving coil speakers. Brand new and perfect and individually boxed. 3-ohm speech coil and heavy duty closed field magnet. Ideal for quality sound reproduction. Money back guarantee.

ONLY **21/-** Each.
2/6d. post and packing.
Don't miss this chance of a lifetime! *Obtainable from:—*

HOME RADIO OF MITCHAM
187, London Road, Mitcham, Surrey.
"The QUALITY component specialists"

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

STORAGE BATTERIES, 12v. 75 AH heavy duty, 19 plates; separate cells in hardwood cases; finest possible specification, approximately ¼ present list: **£7/17/6**, plus 9/6 delivery.—Below.

6v. 90 AH, 15 plates, hard rubber cells; also suitable for cars, tractors, lorries: **£3/7/6**, plus 7/6 delivery. TEDDINGTON ENGINEERING CO. LTD., Dept "C," High St., Teddington, Middlesex.

VIEWMASTER, stages 1-4 assembled, **£8.** NOBLE, Huby, Sutton, York.

ARGUS T.V., five units; must clear, moving; quick sale; **£8,** 9, Highfield Ave., Farnborough, Kent.

WINWOOD FOR VALUE.—Short wave Receiver, 8 valve, operated by 6-volt battery, complete with all valves, fully tested and ready for use; outstanding value at **£6/6/-**; carr. paid. Brand new T/V strip type 196, complete with V/screens, but less valves; V/line-up, 8xCV138, 1xCV140, 1xCV417, complete with co-ax plugs and sockets; Unit Measures, 10in. x 1½in. x 2½in., 24/6, post free. New valve/component list ready. WINWOOD, 12, Carnarvon Road, London, E.10. (Mail only.)

EDUCATIONAL

FREE! Brochure giving details of Home Study Training in Radio, Television, and all branches of Electronics. Courses for the Hobby enthusiast or for those aiming at the A.M.Brit.I.R.E., City and Guilds Telecommunications, R.T.E.B., and other Professional examinations. Train with the College operated by Britain's largest Electronic organisation. Moderate fees. Write to E.M.I. INSTITUTES, Postal Division, Dept. PT28, 43, Grove Park Rd., London, W.4. (Associated with H.M.V.)

I.P.R.E. Data for constructing TV Aerial-strength Meter, **7/6**; 5,500 Alignment Peaks for superhets, **5/9**; sample copy "Practical Radio Engineer," **2/-**. Membership-examination particulars, **1/-**. Syllabus of seven postal courses free and post free. SECRETARY, I.P.R.E., 20, Fairfield Road, London, N.8.

WATERLOO RADIO

35, Tenison Way (Waterloo Bridge Roundabout), London, S.E.1.

COLLARO 3-Speed Autochangers Type 3RC/521. Supplied brand new in unopened cartons complete with Long-playing and standard pick-up heads. 100-250 v. A.C. There is only a limited number of these fine 3-speed changers available but whilst supplies last one will be reserved on receipt of £1 deposit so don't miss this opportunity. **Bargain Price, £9-19-6,** carriage 7/6.

VALVES.—6AM6, 6CH6, 6BA6, 6BE6, 12BE6, 6BJ6, 6BW6, 6BW7, 3A4, N18, W77, U78, 6V6g, 6K6g, 12AX7, 7/6 each, or 3 for 20/-. Your Selection.

Germanium Diodes, wire ends, **2/-** each, 20/- doz.

METAL RECTIFIERS.—Bridge 12v. at 1 amp 5/11, 2 amp 7/11, 3 amp 9/5, 4 amp 11/5, 6 amp 15/8. Half-Wave. 125 v. RMS input. RM1 60mA 3/9, RM2 100mA 4/3, RM3 120mA, 5/3 RM4—TV Rectifier, 250 v. 275 mA., 15/6.

News from the Trade

Ekco Electronics Appointments

MR. E. B. THOMPSON has been appointed sales manager of Ekco Electronics, Ltd., and Mr. R. Y. Parry the company's technical manager, Nucleonics.

Mr. Thompson joined the parent firm, E. K. Cole, Ltd., in 1937, and in recent years has been responsible for the export sales of Ekco communication and electronic equipment.

Mr. Parry, who has been with E. K. Cole, Ltd., since 1936, has been associated with the development of Ekco nucleonic equipment since its inception.—Ekco Electronics, Ltd., Ekco Works, Southend-on-Sea, Essex.

"Bowjection" "Clubman" Model

THIS, as can be seen below, is a modern styled veneered cabinet, 38in. high, 19in. wide, 22in. in depth at base tapering to 12in. depth at top. It has a black plastic surround to optical aperture with gold-coloured woven fabric covered "flick-over" panel, operated by knob as shown, to cover optical aperture when unit not in use.

Provision is made for varying screen heights. Castors are fitted for easy positioning; there is a 10in. speaker and provision for extra speaker.

Fitted with Mk. II dual chassis which have an improved E.H.T. supply unit, automatic focus control, new design tube protection circuits and numerous other interesting technical features. Chassis interconnection by high-grade multi-point plugs, and a novel method of suspension which allows extremely quick access to top or underneath of chassis.

The new 'Clubman' Bowjection Receiver.

Special attention has been given to quality and robustness of all components. Retail price, £150.

For use with this projector is a curvatured wall type screen featuring non-glare screen material, wide angle viewing, surround of modern design, and cabinet finish. Adjustable angle bracket and simple method of height adjustment. Retail price, £10.—Rainbow Radio Manufacturing Co., Ltd., Mincing Lane, Blackburn, Lancs.

Winter Trading Co. (English Electric Tubes)

THIS company has been entrusted with the sale of English Electric 16in. tubes as one of their distributors. This arrangement dates from November 1st, 1953, and they inform us that they have undertaken to keep adequate stocks of the tubes at their London warehouse and branches in Southampton, Birmingham and Cardiff. Initial deliveries of English Electric Tubes are now arriving and their trade counters will be able to deal with customers' enquiries immediately.—Winter Trading Co., Ltd., 6, Harrow Road, London, W.2.

Aren to Change Name

AREN (RADIO & TELEVISION) LTD., who have been manufacturing and selling television receivers since 1938, are to alter their title to Nera of England, Ltd.

This change of name has been decided upon following the expansion and widening character of the company's activities both in the home and export markets.

The trade name Nera, now well known in this country and abroad in connection with the company's large screen television receivers, is a reversal of the original name, "Aren." The word "England" has been included at the request of their overseas customers.

Besides the manufacture of television receivers and components, the company is engaged on the production of electronic instruments such as the Sub-standard Frequency Generator as supplied to the British Electricity Authority and other users.—Aren (Radio & Television), Ltd., Jeffries Passage, High Street, Guildford.

New Osram Valves

THE G.E.C. announce an addition of seven new valves to the famous Osram range. These have been designed to meet various special requirements, particularly in the television and car radio fields. They include a signal frequency and I.F. amplifier as well as video amplifier and sync separator. Full details are available from General Electric Co., Ltd., Magnet House, Kingsway, W.C.2.

QUERIES COUPON

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

PRACTICAL TELEVISION, December, 1953.

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