A SWITCHED TV/F.M. RECEIVER

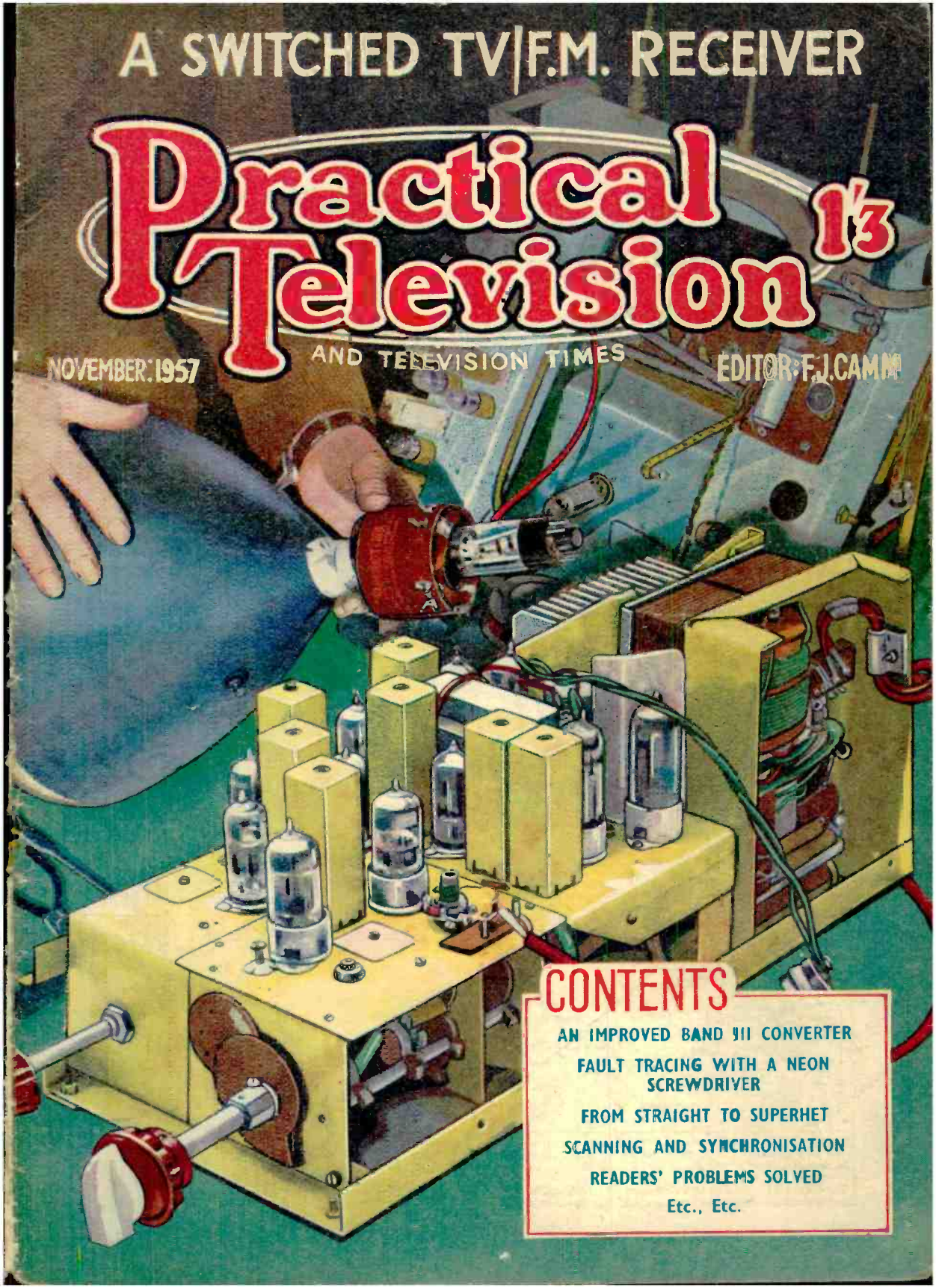
Practical Television

1/3

NOVEMBER 1957

AND TELEVISION TIMES

EDITOR: F.J. CAMM



CONTENTS

PREMIER RADIO CO.

OPEN TILL 6 P.M. SATURDAYS

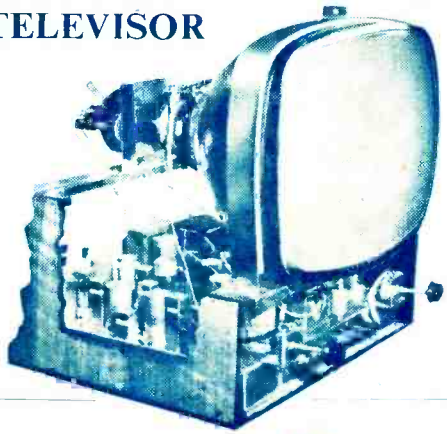
(Regd.) B. H. MORRIS & CO. (RADIO) LTD.

(Dept. P.T.11) 207, EDGWARE ROAD, LONDON, W.2

Telephone: AMBASSADOR 4033 PADDINGTON 3271

Build the NEW "MAYFAIR" TELEVISOR

which gives complete SAFETY to the constructor!



These Televisors use a double wound mains transformer which gives you complete safety from contact with the mains supply when handling the chassis or controls.

★ **B.B.C. & I.T.A. DESIGN** With New Turret Tuner may be built for **£33.7.11** plus cost of C.R.T.

Build in 5 easy stages. Full Construction details available. Instruction Book, 3/6 Post Free.
Console Cabinets with full length doors for 14in., 16in., and 17in. tubes. Price **£14.14.0.**
H.P. Terms: Deposit **£7.7.6** and 9 monthly payments of **18/6.**
Console Cabinets. Half door **£12.12.0.**
H.P. Terms: Deposit **£6.6.0** and 8 monthly payments of **18/3.**
On above cabinets add **21/-** for pkg. and carr.

The "Petite" PORTABLE

MAY BE BUILT FOR £7·7·0

plus 3/- post & packing.

- ★ Size only 8in. x 8in. x 4½in.
- ★ Weight, including batteries, 5½ lb.
- ★ 4 valves of the economy type.
- ★ Medium and longwave superhet circuit.
- ★ High Q frame aerials.
- ★ High sensitivity on both wavebands.
- ★ Prealigned IF transformers.
- ★ 5in. speaker of the latest type.
- ★ Automatic on/off switch operated by lid.
- ★ Designed in our own laboratory.
- ★ Backed by an up-to-date Technical Information Department.
- ★ Components available separately if desired.
- ★ Simple to construct, using normal soldering methods.
- ★ Mains unit will be available later.
- ★ Instruction book 1/6.

Batteries extra.

HT 10/- (Type B126) or equivalent.
LT 1/6 (Type AD 35) or equivalent.

The New De-Luxe TAPE RECORDER TR3

for

£5·18·0

DEPOSIT & 8 MONTHLY PAYMENTS OF £5·16·3

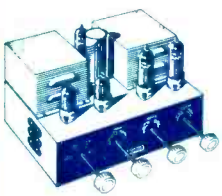
OR CASH 45 GNS.

plus 21/- post & pkg.

TRADE ENQUIRIES WELCOMED

Case finished in Red and Cream with gilt styling and fittings. Size 18½in. x 15in. x 9in. for A.C. Mains 200/250 v. 50 cycles.

8-WATT AMPLIFIER

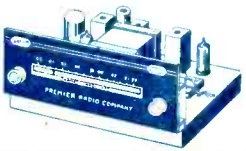


This design includes 5 miniature Valves of the latest types, an Ultralinear Output Transformer suitable for Speakers of 3 and 15 ohms and a very attractive Perspex front panel with gold lettering, complete set of parts, **£8.8.0.**

Postage & Packing, 5/- extra.

NEW F.M. TUNER

for the Home Constructor



A new design using the latest circuit techniques. Includes 4 valves plus magic eye tuning indicator, permeability tuning and an integral power supply. Two controls only, a gear driven slow motion tuning control and an output volume control with on/off switch. Suitable for fringe area reception.

Less Mains Transformer & Rectifier, **£7.12.6,** plus packing and postage. 3/-.

OR components may be purchased for **£8.15.0.** plus packing & postage 3/6.

Power requirements H.T. 230 v. 50 mA., L.T. 6.3 v. 1.5 A. Dial size 3½in x 11½in., overall size 11¾in. long, 5¼in. deep, 4½in high.

WHY buy surplus or reconditioned tubes when these Fully Guaranteed Wide Angle Tubes are available? The latest type 17in. Rectangular Tube MW43/64 by Telefunken at **£17** (inc. tax) post and packing 21/- extra. Also 14in. Rectangular Tube type 14 LPA **£13.17.6** (inc. tax) pkg. & carr. 15/- extra.

Practical Television

& TELEVISION TIMES

Editor : F. J. CAMM

Vol. 8 No. 88 EVERY MONTH NOVEMBER, 1957

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.

SUBSCRIPTION RATES
including postage for one year

Inland - - - 19s. per annum
Abroad - - 17s. 6d. per annum
Canada - - - 16s. per annum

CONTENTS :

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

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

TELEVIEWS

TV AND THE CINEMA

THE effect which TV is having on the pattern of family life is exemplified by statistics recently published in America where over 6,000 cinemas have closed their doors since 1946 and nearly half of the 20,000 remaining are running at a loss. Efforts are being made to rejuvenate the interest in the cinema by showing movies in the home by transmission from the theatre.

It may be that some similar scheme in this country, whereby there are regular transmissions of popular films, could help to revive the waning fortunes of the cinema industry. In this country it is well known that large numbers of cinemas have closed. This is not, however, altogether due to TV, which is being blamed for so many changes in national tastes and habits. It is due in some part at least to the spate of fifth-rate films which has flooded the country, mostly from America, the main theme of which seems to be the vital statistics of some half-witted female without any histrionic ability. Few of these films live up to the superlatives which are used in describing the film.

The fact has to be faced, however, that TV must, to some extent, cut across older forms of entertainment, at least until the novelty wears off.

FIRE WARNING ON TV

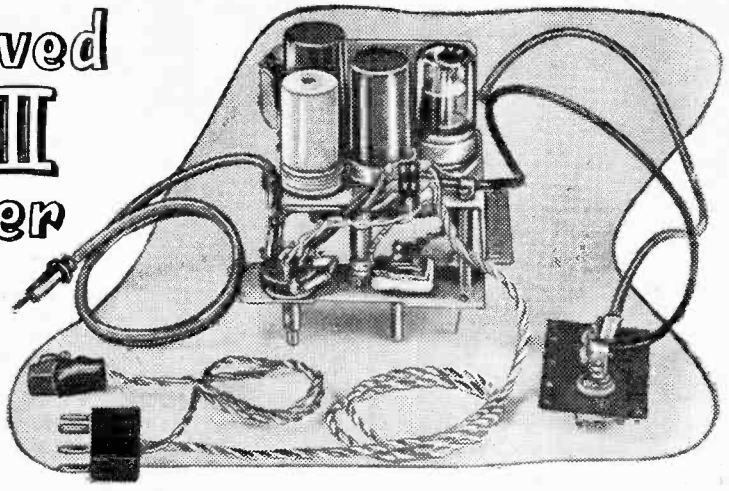
A CORONER recently issued a warning that television sets which are not switched off at the mains or are not unplugged each night are a potential source of danger. In the case he was considering there was no evidence that the television set had caused the fire which could have been due to three possible causes. The lead of the television set and the transformer were live, because the set had not been unplugged and the switch was in the wrong position, a temporary lighting arrangement had a defective lead passing from the kitchen to the room or there was a fault in a wall plug. Very few television sets are switched off at the mains. The switch on the set is mostly used. None the less, it is wise to switch off the set at the mains as well as at the set.

COLOUR TV DEVELOPMENT

ONE of the leading American manufacturers is marketing a colour TV receiver with a simplified colour tuning system to which a colour guide and pointer has been added to each control to help the viewer select his favourite colours. Once the dials are set, no other colour tuning is necessary. The sets use a new picture tube, giving a more brilliant picture for brightly lit areas. Unfortunately, however, the cost of these receivers is greatly in excess of that of standard models and it is known that colour TV in America is not at present a financial success.—F.J.C.

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

An Improved BAND III Converter



This Article is Written to Help Readers Who are Having Difficulty in Obtaining Satisfactory Reception on Band III with EF50 and EF80 Valves

By "Diadem"

IN a large number of published designs there is a feeling by the user that more gain is required, but there is no means of "turning up the wick" apart from adding an I.F. or R.F. amplifier to the converter. With the circuit about to be described, in a low-lying city, 30 miles from the transmitter, the gain can be increased until the picture goes negative, and this is not a swamp area, as a five element array is necessary for a good picture. The grain is not normally noticeable at usual viewing distances, and the picture is very sharp and clear, with full transmitted bandwidth. Being only this distance from the transmitter, it was not found necessary to alter the contrast on the receiver, as there is enough gain from the converter in the service area. Once the gain control on the converter is set correctly there should be no need to touch either control again. Readers with contrast controls in the first R.F. stages of their receivers would be wise to fit one in the last I.F. or video output stage, and then the first R.F. stage contrast would become the sensitivity control and in most cases could be left at max., and the

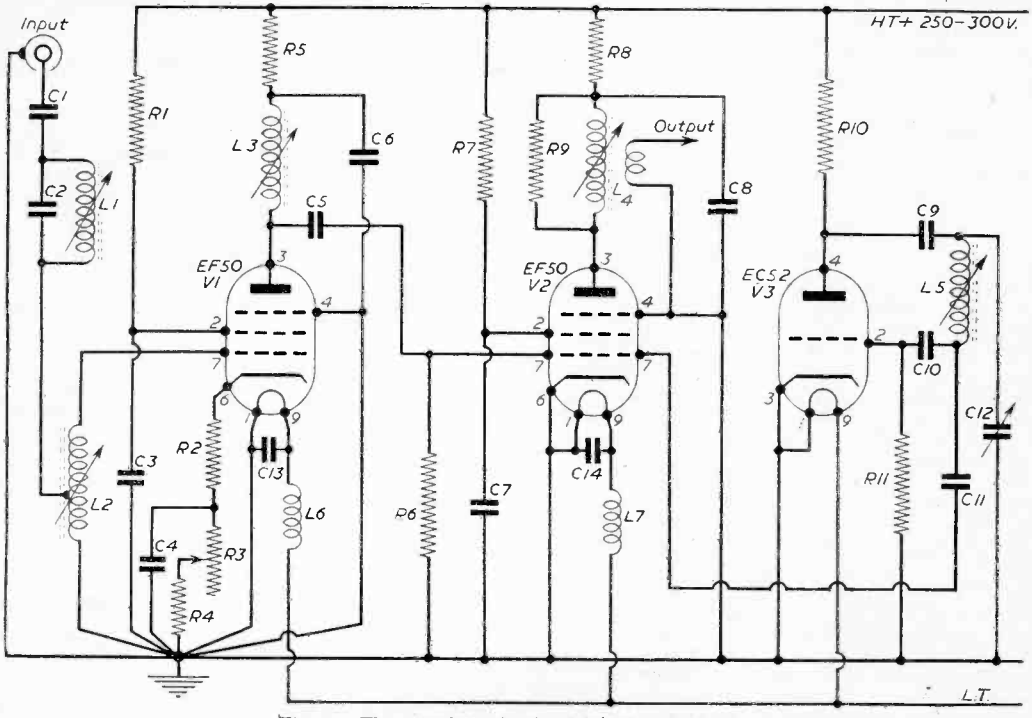


Fig. 1.—The complete circuit of this new converter.

new control finally operated to obtain correct contrast on BBC programmes and then left alone. By this method the sound on the BBC is not affected and, more important, neither is the sound output from the converter affected. With no perceptible oscillator drift, and the contrast controls arranged as above, the writer is in a rather fortunate position of only having to turn the band switch to change the programmes, no other adjustments being required to brilliance or contrast controls. The converter has been working satisfactorily for the last ten months in front of an Ultra V600.

The writer, although just in the service area a mile uphill from the city centre, is living in an awkward spot where five element aerials are necessary, and only a mile away on higher ground strong signals of Band III are obtained on an ordinary BBC "H" aerial by using the third harmonic (Channel 4 and 8).

Converters with modern valves specially designed for Band III work quite satisfactorily here, but trying to get the conventional circuit with EF50 valves working was hopeless, and only the centre of the test card could be seen very weakly owing to the losses and the damping imposed by the EF50 at 200Mc/s. Many circuits were tried such as EF50 R.F. and EF50 osc./mix. two earthed grid triodes EC54s in cascode, and EF50 osc./mix. two EF54 R.F. stages and EF50

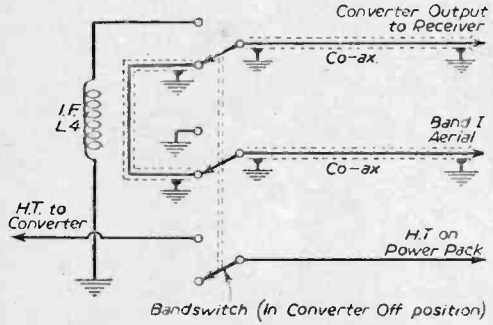
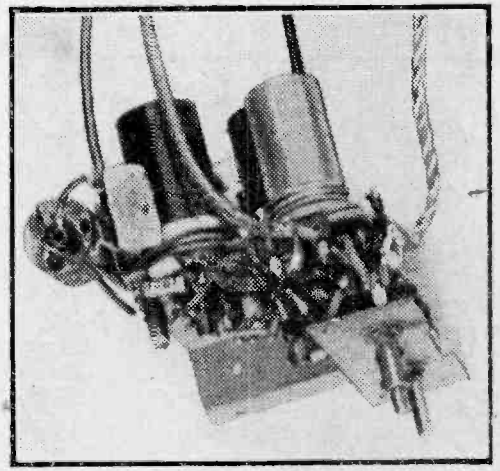


Fig. 3.—Bandswitch circuitry.

osc./mix, but none was really satisfactory until R.F.-mixer and separate oscillator were tried, and even then the signal was very poor until the R.F. cathode decoupling condenser was removed and regeneration was controlled by a variable potentiometer. The signal then improved 100 per cent. At first glance, by removing the condenser the characteristics of the EF50 are altered, the transit time, gain, mutual conductance should drop and feedback introduced; in fact, the whole thing should be a dead loss on Band III, but in this case it is not so. Theoretically it should work more efficiently with a low capacity about 50pF than without one, and a low resistor, but in practice this was not so. Twelve months ago when this converter was first built no designs were available using EF50 valves, and the writer had to start from scratch, not knowing whether the valves would work at these frequencies. After working on many of the previously mentioned designs for many weeks, a large amount of experience was gained on the peculiarities of R.F at Band III frequencies with these wide based, screened EF50 valves. The design requires to be well thought out in advance to keep the wires from the components to a minimum of ¼in. if possible. This is very important, and great losses can occur if the wires are ½in. or more in certain



A view of the complete converter.

parts of the circuit. With these valves the screened grid decoupling condenser C3 is one example in the first stage. The wire from this condenser to chassis should be as short as possible, and must be wired to the same tag as the earthy end of the first R.F. coil L2. The same applies to R2 right up to the cathode pin, as R2 is now part of the tuned circuit through not being decoupled. On C4 the earthy end wire must be very short, and taken to the same chassis tag as C3.

The first stage in converters seems to be the most critical regarding losses and wiring layout, and if weak signals are encountered the design of this stage is usually responsible. The mixer and oscillator stages are not critical provided reasonable precautions are taken and are quite easy to get working.

Power Supply

The set will work quite well with lower gain on 200v. but at 250v. or higher the gain is con-

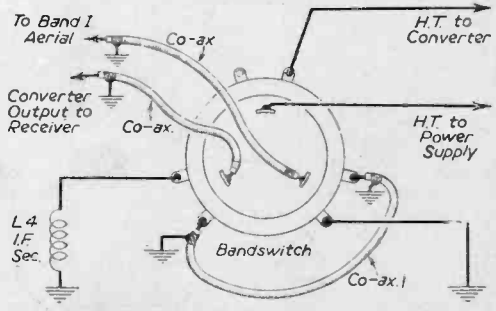
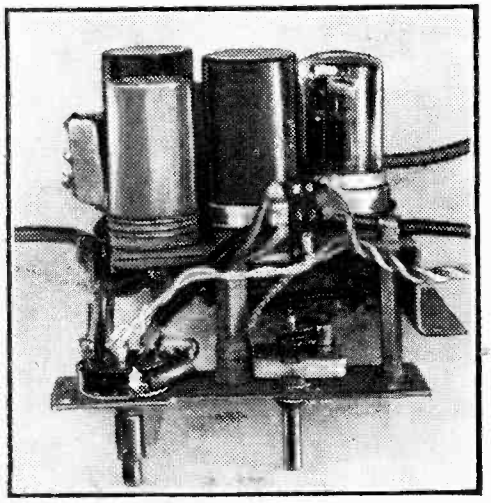


Fig. 2.—Bandswitch wiring details.

siderably increased. The writer works on 300v. H.T. at 22mA. without any apparent ill effects on the valves, and the gain is much greater at this voltage. The converter has worked satisfactorily at 300v. up to 45 miles from the transmitter, and may be satisfactory beyond this mileage under suitable receiving conditions. Raising the H.T. from 240v. to 300v. appears to have very little effect on the volume of sound but



The compact layout may be seen from this illustration.

the vision is very much affected. The L.T. is 6.3v. at 1 amp. The power pack is isolated from mains for safety, and transformer fed.

The Circuit

This is a three valve arrangement using EF50 as R.F. amplifier, EF50 as the mixer, and EC52 (VR137) as the oscillator. The circuit is designed for 80Ω co-axial input. C1 in the aerial lead has a marked effect on signal strength and helps to improve matching to the input. 1,000pF was found to be the best value, but as this is rather higher than usual a variable trimmer can be wired in its place if desired to find the correct value to suit individual cases. This feeds into a filter circuit L1 and C2 and to the grid input coil L2, which is tapped ½ turn from the earthy end.

No improvement was found by winding a separate primary over L2 for the aerial input, although a separate primary will be required for correct input matching of 2 turns if the cable is 300Ω.

The cathode is not decoupled in the usual way, but C4 is connected between R2 and R3 and the gain controlled by R3. By omitting this condenser direct from the cathode to the chassis, feedback is introduced, and also the input resistance increases, thus reducing the damping on the tuned circuit. As the input resistance of the EF50 is only a few hundred ohms at 200Mc/s, losses would be considerable if 1,000 pF was introduced into the cathode circuit. The EF54 is only 700Ω at 200Mc/s. and this valve is an improvement over the EF50 for V.H.F. work. The EF54 has the suppressor grid connected internally to the cathode, and was not found as suitable for this circuit with the gain control. Leaving the cathode completely unby-passed reduces the mutual conductance slightly but this seems to be well compensated for by an increase in input resistance.

The output of V1 goes direct to C5, the coupling condenser, and to the mixer grid.

The oscillator V3 is very stable, and no drift was perceptible from the moment of switching on to switching off, even after several weeks' use, which is most unusual at these frequencies. The oscillator is not the usual Colpitts type as the Hartley type was found to be better. This valve operates with two condensers, C9 and C10, to couple the oscillator coil L5 to V3. C9 has negative temperature coefficient. C12 is the manual oscillator trimmer. The output from the oscillator is taken through C11 and fed into the mixer grid.

(To be continued)

LIST OF PARTS

R1—10K	C1—.001mfd
R2—150Ω	C2—20pF
R3—300Ω var.	C3—330pF
R4—200Ω	C4—330pF
R5—2.2K	C5—10pF
R6—100K	C6—330pF
R7—100K	C7—330pF
R8—2.2K	C8—330pF
R9—4.7K	C9—N50pF
R10—10K	C10—15pF
R11—27K	C11—2pF
	C12—0-20pF var.
All ½ watt	C13—100pF
	C14—100pF
R10—1 watt	C1—Var. or Mica.
	All others Ceramic

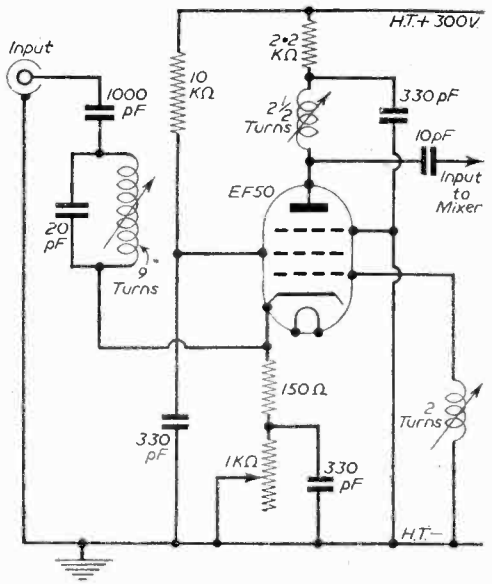


Fig. 4.—One form of input stage.

The Radio and Television Exhibition, 1957

THE MARQUIS OF DONEGALL REVIEWS SOME OF THE MORE INTERESTING EXHIBITS

BEFORE reviewing the Radio Show of 1957, twenty-fourth of the series, let us take a little general stock. Let us remember, for instance, that the world's first regular public television service was started by the BBC 21 years ago and that television made its first public appearance at the Radio Show in 1936. In spite of the fact that, owing to the war, television and its development in this country has only functioned for 14 years, there are now reckoned to be some 7,000,000 sets operating in Britain and 1,500,000 are sold every year.

From the BBC's imperfect beginnings—and well I remember them, having taken part in a debate between authors and journalists in 1937—we now see that 45 countries have television services and that the television set has even penetrated into the bath-houses of Japan! The United States leads the field by miles, in quantity, with 500 stations and 44,000,000 sets in U.S. homes. Last comes Bulgaria, with experimental transmissions at week-ends and an estimated 200 sets. Nor is the growth of television in the U.S.S.R. to be lightly laughed off: there are transmissions from 24 stations to 1,500,000 sets. The Russians are reckoning to try out a colour transmission in 1958. Next to Bulgaria the most backward countries are Hungary, Rumania, Iraq and Uruguay, which boast only about 2,000 sets each. In proportion to its size, Monaco must easily lead the world with 10,000 sets somehow packed into this tiny Principality.

Meanwhile, international television is being greatly extended. Next year Yugoslavia should link-up to Eurovision through Trieste. So also should Spain and Portugal, which already have television, come to our screens through Toulouse. Sweden already gets programmes from Denmark and the reverse process should start soon. Israel recently became a member of the European Broadcasting Union. This means that every country in the European zone—outside the Iron Curtain—including Egypt, is now a member and is engaged in playing its part in developing the international exchange of television programmes.

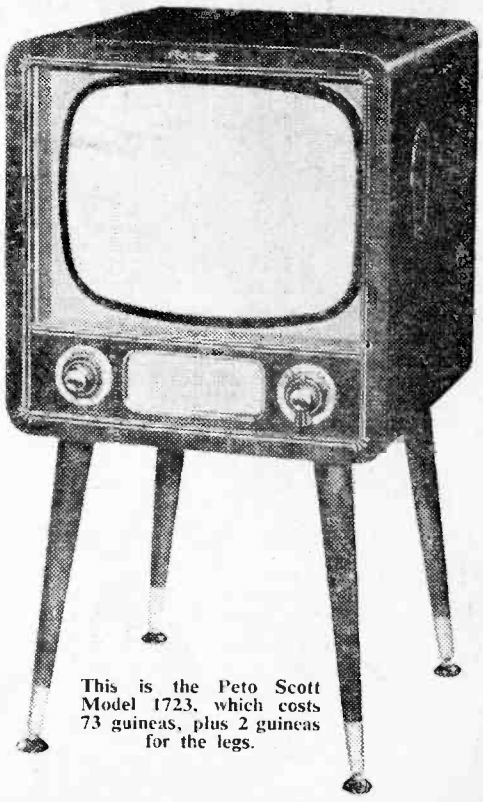
With all this planning and expansion going on, and with the recognised superb quality of British radio and electronic products, there is still room for surprise, and certainly for congratulation, in the fact that in 1946 overseas sales amounted to just under £8,000,000 and that in 1957 they are expected to top £44,000,000. In fact, the rise in the value of radio and electronic products from 1955 to 1956 was about 20 per cent., as compared with 10 per cent. for all national exports.

Since 1949 the largest proportion—about 80 per cent.—of the industry's exports have gone to Europe and the Commonwealth, but the United States, with £3,500,000 in 1956, was the largest single buyer, and this market continues to increase, particularly in the field of record-changing mechanisms.

Portables

Perhaps because I was one of the first customers to order an Ekco portable television at the 1955 Radio Show, I was on the lookout for portables and they were certainly a main feature of this year's exhibition. There were some ten different makes, which included Defiant, Ferguson, H.M.V., McMichael, Sobell, Pye, Spencer-West, and Alba. Unlike my Ekco, they mostly have 14-inch screens; but I think I am right in saying that the Ekco is still the only one that has V.H.F. Radio included and can also work off your car battery if so desired.

Of the portables, the most expensive seems to be the Pye at 65 guineas, including tax, and weighing about 40lb. Pye are shortly to market a cheaper model called the "Small-boy." The

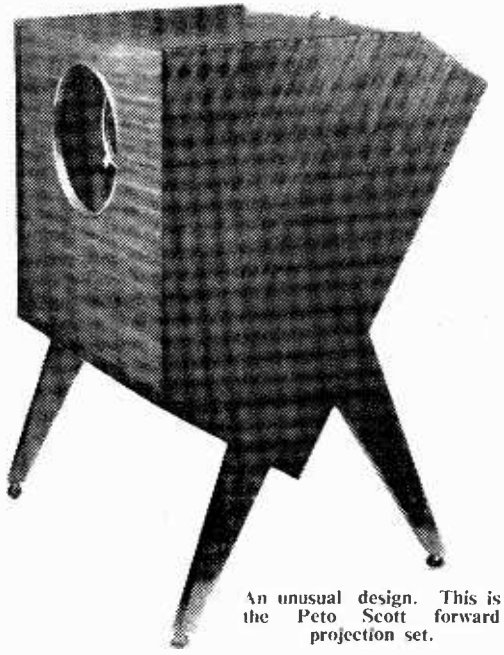


This is the Peto Scott Model 1723, which costs 73 guineas, plus 2 guineas for the legs.

price was not available, but the know-alls were predicting 49 guineas.

Most of the other portables cost between 50 and 58 guineas, except for the Spencer-West, which costs 45 guineas, and comes in red, green, brown and blue combined with mushroom and in black and white. This little set weighs only 17lb. As marketed, it has a 12-position turret, fitted with local BBC and I.T.A. wafers. Additional wafers for all twelve channels can easily be substituted and cost 7s. extra per channel.

It was obvious that every effort has been made by the industry to cram the maximum amount of



An unusual design. This is the Peto Scott forward projection set.

picture into the minimum amount of cabinet. In the past the television set has inclined to be something of a monster, overshadowing and disproportionate to some of the rest of a room's furniture. So the television set has grown thin legs, giving it a "contemporary" look which I find a considerable relief from its former squat-massiveness. The leg tendency applies equally to radiograms, table-sets and record-players.

Again pursuing the "less-cabinet" policy, there was the bentwood cabinet, in which the maker has practically wrapped the ply round the edge of the tube.

Thirdly, the wide-angle (90-degree) scanned tube gives us cabinets some 4ins. shallower from back and front and a diminished "bowler-hat" at the rear.

Tubes

Shortly after the war tubes had deflection angles of about 55 degrees, but no modern tube has less than 70 degrees. When a 21in. rectangular tube is changed from 70 degrees to 90 it becomes about 3ins. shorter, and the latest trend is towards 110 degrees deflection, which would result in lopping off another 3ins. in depth. (Incidentally, the size of a rectangular tube is the diagonal length of the viewing surface. Whereas the old type of round tube was blown in one piece, the screen face is now pressed or moulded separately and joined to the other parts by means of automatic machines. This gives far better facilities for inspecting the partly finished product.)

V.H.F.

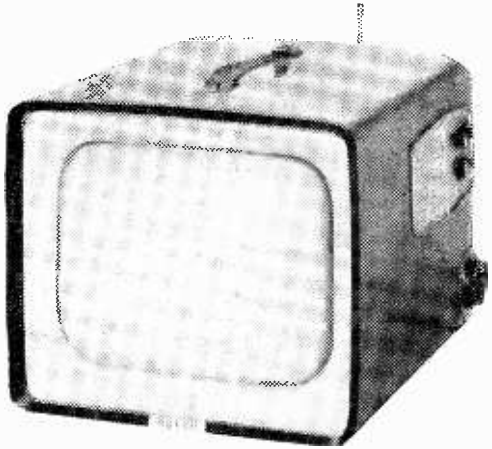
Two sets for the price of one has been the aim of several manufacturers. That is to say, that for an extra fiver or so you can have reception of the three V.H.F. transmissions of the Home, Light and Third programmes.

An example of where V.H.F. is provided in the price with a 10in. × 6in. specially developed elliptical speaker for V.H.F. is the H.M.V. model 1867 at 120 guineas. It is also a good example of the thin legs and reduction of massiveness remarkable for a set with a 21in. tube.

V.H.F. is also ready to use in the 17in. Ferguson Consolette at 81 guineas.

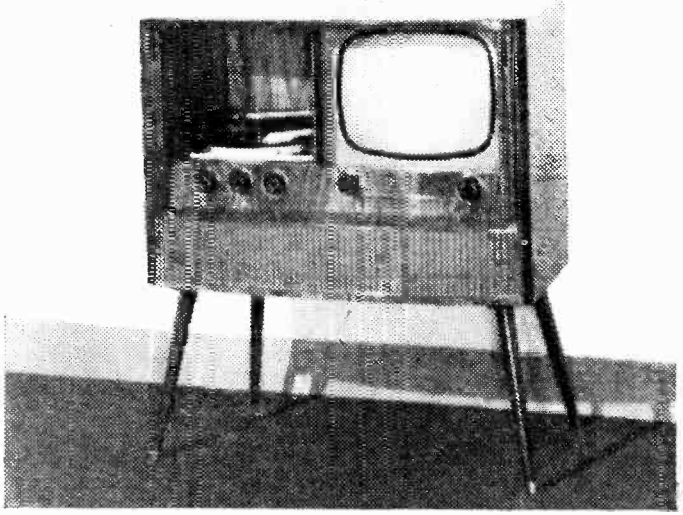
As no separate radio chassis is involved to incorporate V.H.F. with a television receiver, some manufacturers, for instance Decca, Ekco and Pye, found it possible to add a gramophone turntable and still preserve reasonable dimensions. And I was told that the Continental style—gloss finish and "gold" metal trim—as exhibited, for instance, by Ferguson, Masteradio, R.G.D. and Regentone, was proving very popular with the public.

Another factor contributing to the compactness of television sets has been the greatly increased number of manufacturers favouring the printed circuit. Truly, the 14in. screen, which was never very popular as a table model, has come into its own as the recognised size for the peacemaker—or second set—on which the younger generation can have Tommy Steele or Wyatt Earp, not to mention Billy Bunter, to their hearts' content, without driving the grown-ups raving mad.



A 14-inch transportable by Sobell. A telescopic aerial plugs into the set.

Last year the battery-operated TV set was introduced as a novelty and I expected to see several more this year. But it seems that the idea did not catch on with the public and there were none to be seen this year, although rumour had it that one manufacturer had withdrawn a battery set at the last moment.



A neat combined TV, radio and gramophone reproducer. This is the Decca model 555, with 17-inch screen, 4-speed motor, with Hi-Fi amplifier with tone controls operating on radio and TV.

Finally, much welcome progress has been made in the design of aerials. Belling-Lee and Meadowdale, for instance, have contrived that every possible requirement of the person putting up the aerial should be met from stock—and at a reasonable price. We see partial pre-assembly and wiring, instantaneous fixing for elements and connexion of Band I and Band III arrays by Aerialite and Antiference, enabling a single lead-in to be used, and new shapes of aerial for all channel reception by J. Beam.

To sum up, the Radio Show of 1957, that corresponded with TV's 21st birthday, was the herald of the second set—whether for justice to minorities in the home or as a portable with which to convert un-TV-minded neighbours. The show also convinced us that the public is becoming V.H.F. conscious, and that by means of modern slimming techniques and the adding of graceful legs the TV set is well on its way to becoming a thing of beauty rather than a monstrous incongruity in the living-room.

And the industry is certainly to be congratulated on the fact that, with all these improvements and welcome trends, prices have remained remarkably steady since this time last year.

SIMPLIFIED TV SERVICING

2.—SETS WITH MULTIVIBRATOR FRAME TIMEBASES

(*Continued from page 128 October issue*)

ONE type of frame multivibrator circuit is shown in Fig. 3. If trouble in holding or loss of height is concerned, then the following components should be checked or changed. I must again stress that in the case of components, the correct one as laid down in the service manual or sheet must be rigidly adhered to. The valve itself should be substituted for a known good one and if trouble still persists then check frame hold and height controls for continuity and correct resistance; also check all other components marked * on diagram. Do not miss C3, which can cause loss of height if low capacity.

In Fig. 4 we find a type that is used in quite a lot of present-day sets. The valves used are triode pentodes and are usually type ECL80 or equivalent. In hold troubles or loss of height the same checks should be made as in the previous type. First, valves, then components as marked in diagram.

Sets with Blocking Oscillator Frame Timebases

Fig. 5 shows this type of frame circuit. This type can easily be recognised by the blocking oscillator transformer. The valve is a triode pentode of LN152 type. The same rule applies, first check valve, then in the following order check C1, cathode condenser of valve, and then controls for continuity, blocking oscillator for continuity of primary and secondary and all components marked on diagram.

General Faults on Frame Oscillators, Circuits, Picture Bounce

This can be due to a microphonic valve. Sometimes tapping the valve will show it up if it occurs only occasionally. A tapping device as shown in Fig. 6 will come in handy for this.

Insufficient Height

shown in Fig. 6 will come in handy for this.

(i) Weak frame output valve.

(ii) Anode and screen volts low on oscillator valve or valves and output valve.

(iii) Main H.T. volts low.

(iv) Incorrect positioning of deflection coils on neck of tube. In all cases these coils should be

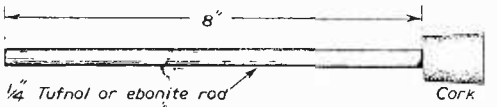


Fig. 6.—A useful device for valve checking. The cork should be firmly fixed to rod and covered with rubber finger-stall.

right up to neck of tube as far as they will go. If either items 3 or 4 are the cause then width will also be affected.

Picture Compressed at Top

This is a fault due to poor linearity. This means that the vertical waveform bends or curves more than it should do, and consequently the electron beam of the C.R.T. does not travel down at an even rate. This causes bunching of the lines in some parts and spreading in others. To correct this adjust linearity control. If this fails to cure, try changing output valve. If no good check anode and screen volts of output valve. Low volts here can cause compression.

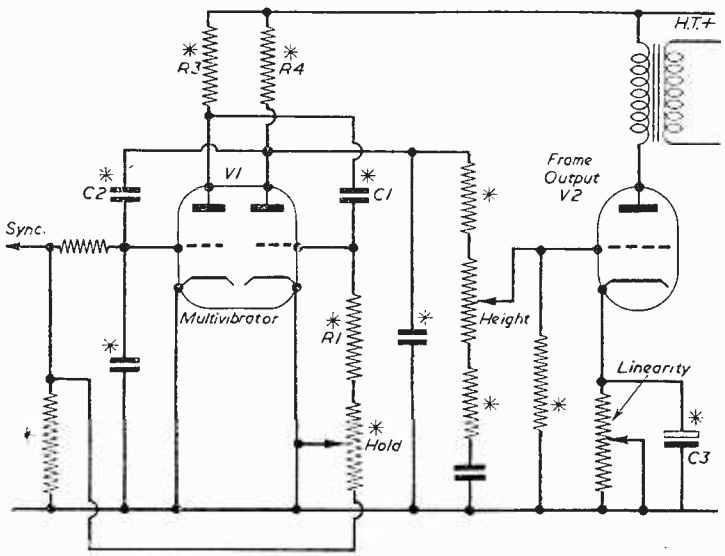


Fig. 3.—Multivibrator using double triode with frame output valve.

Vertical Foldover

This can be considered as an aggravated form of non-linearity. Vertical foldover is when the bottom of the picture consists of a bright horizontal stripe across the picture. It represents where the scan has stopped moving downwards. This is generally caused by a component being faulty between the oscillator portion of frame circuit and the output valve of frame circuit. A leaky condenser or a decrease in value of grid resistor will cause this, so also will a faulty condenser in the cathode lead of frame output valve. Of course, the output valve itself could be the culprit.

A Bright Horizontal Line Across Picture

This is not as the previous fault, as this is not turnover, but is generally due to heater/cathode leak in output valve.

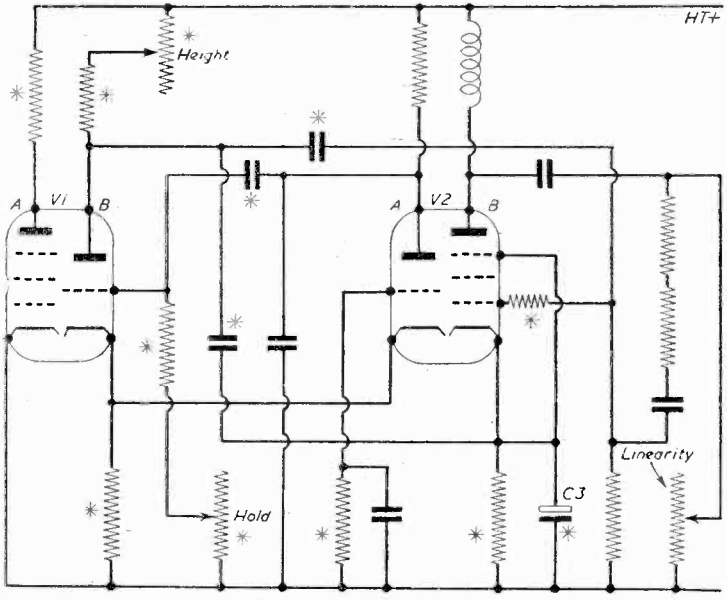


Fig. 4.—**Multivibrator using two triode pentodes, two triodes as multivibrators, one pentode as sync. valve, one pentode frame output valve.**

Trapezoidal Effect

This fault is where the picture is nearly at its maximum height on one side and narrows down across the tube until it is about half the height on the other side. This is caused by shorted turns in the frame deflection coils on the C.R.T.

Line Timebase Circuits—Sets Using Blocking Oscillators

Fig. 7 gives a type of line timebase circuit as used in sets in the 1952 period. Here we have a triode acting as blocking oscillator and feeding into a pentode line output valve. It will be noticed that EHT for the C.R.T. is taken from here, so that as in very many cases, if there is no line scan, there can be no EHT, therefore a blank screen. When one runs across trouble in this part of the circuit, the first suspects are naturally the valves, and in a circuit of this description *all* the valves must be checked. After valves, check components as usual, not forgetting the blocking oscillator transformer. A likely cause of breakdown with no EHT and no sound of the 10kc/s whistle is the line output transformer. Now most manufacturers give in their service data the resistance values of various sections of this transformer, but unfortunately even this is not an absolute check, as under the high voltages that appear across certain sections of the windings during working shorting can take place that a meter test will not show up. In a case of this description, having made certain that everythong else in circuit is O.K., the only thing to do is to change it. Be careful when changing to mark each lead as taken off the faulty transformer, so that the new one is correctly connected.

Sets Using Single Valve Line Oscillator/Output

A circuit of this type is shown in Fig. 8. The same procedure of tracking faults should be adopted as in other line circuits. The line oscillator/output valve is a pentode generally of the PL38 class. In case of insufficient width or failure to hold, check this value first. If raster is O.K. then EHT rectifier can be omitted from check.

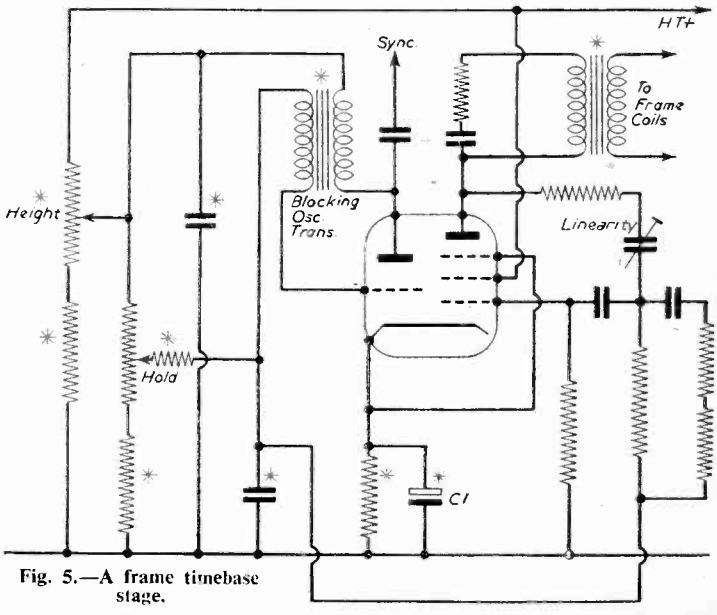


Fig. 5.—**A frame timebase stage.**

General Faults on Line Timebase

It can be generally stated that valves are the most important source of trouble in timebase circuits. Hence the rule, check the valves first. If these are found O.K., then it will either be faulty waveform or sync trouble. As this article only calls for a meter for fault finding, waveform trouble will only be found out by substituting components in the section where the waveform is generated. This means the oscillator section and then of course the output section of oscillator and the components in between.

Horizontal Slip or Lack of Synchronisation

I expect all readers have experienced this at some time or other, and if no fault is there they have corrected it with the line hold control. Now should this control not be able to effect this, then we must check for faulty components. In both Figs. 7 and 8, or in any line output circuit, check continuity of line hold control and all components in that circuit. Also examine connections from sync.

trolled for about 40 per cent. by the damper valve and the remainder of its travel by the output valve. So we can deduce that if a fault is occurring on the left-hand side, the defect is most likely to be concerned with the damper tube circuit. If on the right-hand side, then it is

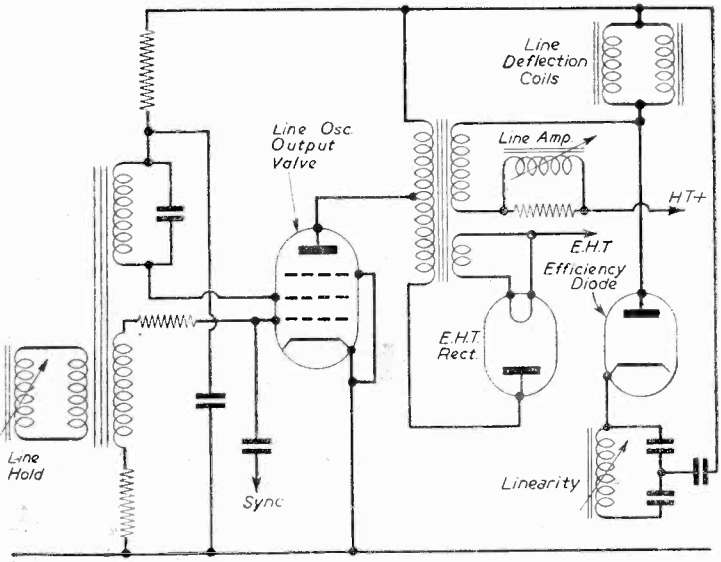


Fig. 8.—A line timebase stage utilising a self-oscillating output stage.

Horizontal Linearity Faulty

In this fault the picture is either compressed or elongated on the left- or right-hand side of the screen. Now if we consider how the beam travels in a horizontal line, we can probably trace the fault. The beam in its horizontal travel is controlled for about 40 per cent. by the damper valve and the remainder of its travel by the output valve. So we can deduce that if a fault is occurring on the left-hand side, the defect is most likely to be concerned with the damper tube circuit. If on the right-hand side, then it is likely to be in the position of the horizontal sweep system, up to and including the output valve. For instance, light or dark stripes on left-hand side will be due to the damper valve circuit. In Fig. 7 check C1 or replace, also linearity circuit. In trouble on the right-hand side, check the grid resistor of the output valve, also the screen decoupler, coupling condenser and cathode bias resistor and condenser.

(To be continued)

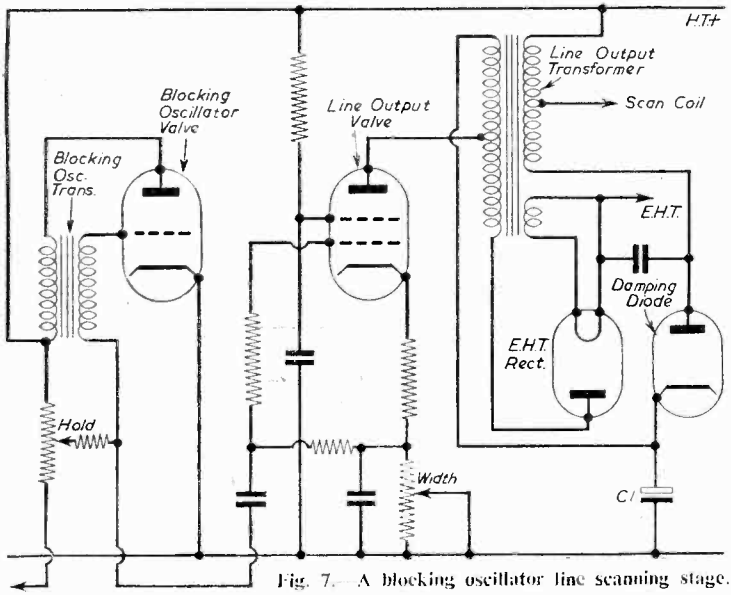


Fig. 7.—A blocking oscillator line scanning stage.

Scanning & Synchronisation

3.—FRAME SCANNING CIRCUITS (I)

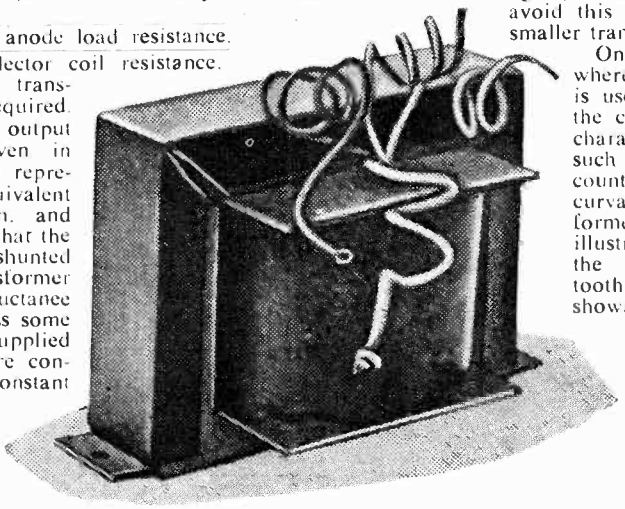
By G. K. Fairfield

IN the first part of this series we saw how the frame deflection coils behave, at 50 c/s, as an almost pure resistive load. A transformer will usually be necessary to match this load impedance to that of the output valve and as in audio amplifier practice we may use the formula:—

$$T = \sqrt{\frac{\text{Optimum anode load resistance.}}{\text{Deflector coil resistance.}}}$$

to obtain the transformer ratio required. The simplified output stage circuit given in Fig. 19 may be represented by an equivalent circuit as shown, and from this we see that the output will be shunted by the transformer primary inductance which will by-pass some of the current supplied by the valve, here considered as a constant current generator.

This inductance must be made as large as possible if the linearity of the sawtooth of current is not to be impaired, i.e., $2\pi f.Lp$ must be much greater than T^2Ry. Taking typical figures for Ry of 40Ω and optimum load of 4,000Ω, then the transformer ratio T=10, and for $2\pi f.Lp$ to be only eight times T^2Ry then a primary inductance of 100 Henries is required. This inductance must be maintained whilst a large direct current flows through the winding, and although a large transformer could be constructed to meet this requirement, other, rather more elegant, methods are available to avoid this difficulty and allow a smaller transformer to be used.



Instructions are given in this article for making up this frame transformer.

One method, applicable where a triode output valve is used, is to make use of the curvature of the Ia/Vg characteristic which is in such a direction as to counteract the inverse curvature due to transformer distortion. This is illustrated in Fig. 20 where the distorted input sawtooth to the transformer is shown to give a linear output modified by the transformer parabolic distortion.

A practical circuit embodying this principle is shown in Fig. 21. Variation of cathode bias potential is used as a linearity control to set the operating conditions on the correct point on the characteristic.

Negative Feedback Circuits

The use of negative feedback is, however, the most valuable method of ensuring a linear output and is far less critical of choice of valve or operating conditions. The feedback can be taken over the entire scanning circuit or confined to the output stage only. As the major portion of

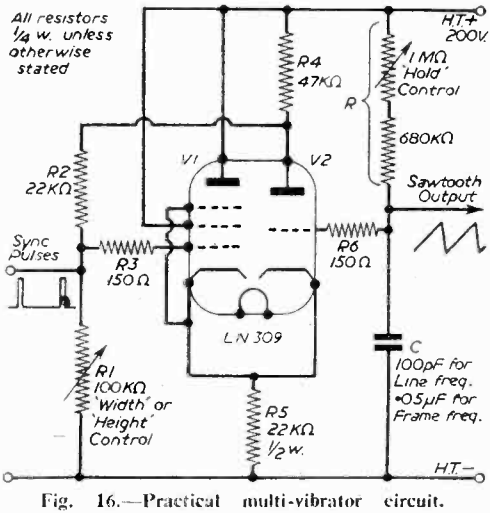
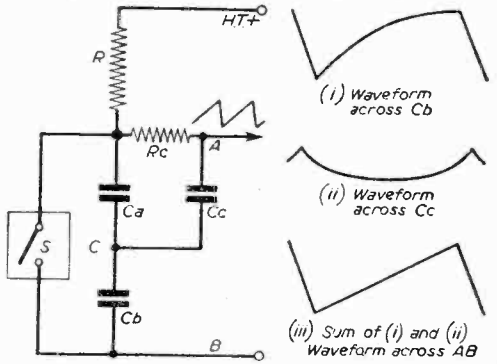


Fig. 16.—Practical multi-vibrator circuit.



Figs. 17 and 18.—Sawtooth linearising circuit and waveforms found in it.

scanning distortion is found in the latter it is usual to confine the feedback to this stage. One simple arrangement is shown in Fig. 22. Across Rf is developed a sawtooth potential proportional to the current flowing through the coils, and this

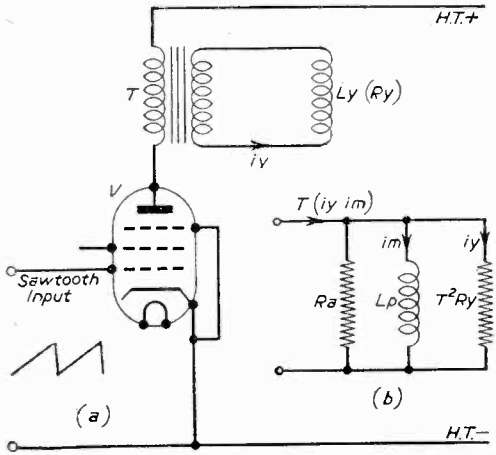


Fig. 19.—Simplified circuit of frame scanner, and its equivalent circuit.

voltage is fed back to the grid in antiphase to the driving waveform from the preceding valve. As this voltage feedback tends to reduce the output impedance of the stage this may be counteracted by a measure of current negative feedback provided by the unby-passed cathode resistor Rc. A large value of negative feedback is not possible with this system due to the loss of scanning power caused by inserting Rf into the trans-

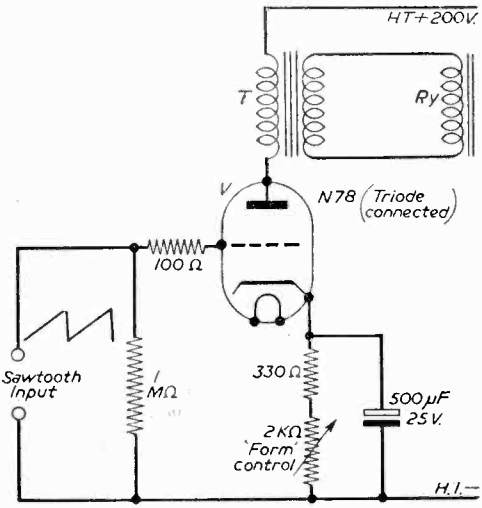


Fig. 21.—Practical circuit of valve curvature linearity correction.

former secondary circuit. If the feedback is taken from the primary and suitable correction made in the coupling circuit, then a more efficient form of feedback is possible.

Complete Frame Scanning Circuit

Such a system is used in the complete scanning circuit shown in Fig. 23. Feedback is taken from the anode of V2 and the coupling circuit comprises a wave-shaping RC network designed to introduce into the grid circuit a suitable waveform to correct for the combined effects of transformer and valve distortion. Two elements of the network are made variable to act as linearity adjustments; R1 will be found effective at the top of the picture, whilst R2 will control the overall scan linearity.

The sawtooth driving waveform is obtained from a cathode-coupled multivibrator V1 and as this circuit is outside the feedback loop good linearity is assured by returning the charging resistor R to the boosted H.T. potential of the line scanning circuit. As this potential can be up to 500 volts the capaci-

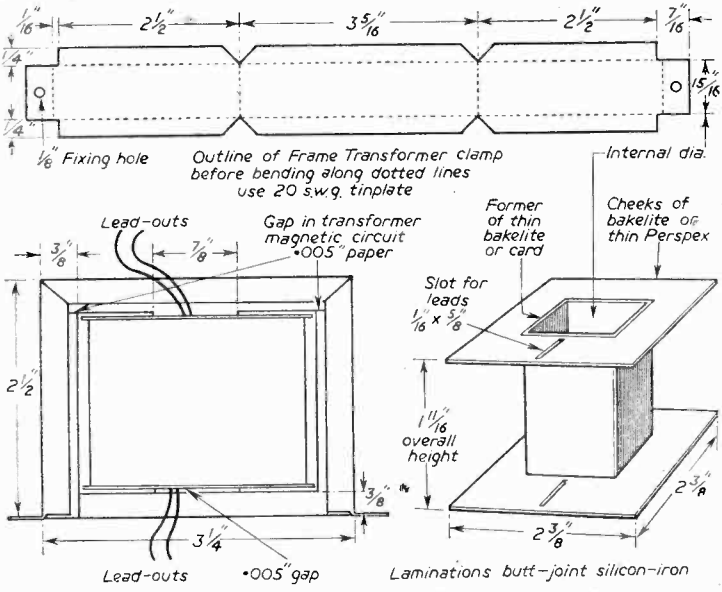


Fig. 24.—Practical details for the construction of a frame transformer.

Winding details:—

Primary—4,100 turns .0092" enamelled copper wire
Secondary— 400 " .018" " " "

Windings pile-wound with 2 layers of oiled silk between prim. & sec. and also over completed winding

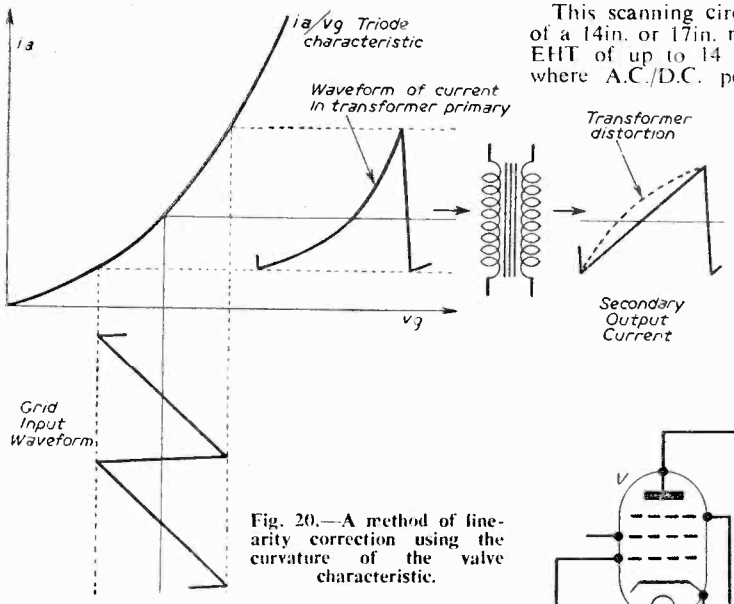


Fig. 20.—A method of linearity correction using the curvature of the valve characteristic.

tor C will only charge to a small fraction of its maximum potential—the condition for good linearity as explained earlier.

A positive square-wave of about 30 volts peak is available from the anode of V1b and may be fed to the grid of the cathode-ray-tube to provide bright-up during the frame scan period. This technique will be found of value to suppress the flyback lines which sometimes tend to obtrude into the picture as the black level changes (often due to the use of a "mean level" automatic gain control system in the receiver section).

This scanning circuit is suitable for deflection of a 14in. or 17in. rectangular tube at an applied EHT of up to 14 kV. and is intended for use where A.C./D.C. power supplies are employed and an H.T. potential of between 180 and 220 volts is available. Deflection coils for this design will be described in a later article of this series. The resistors R3 and R4 connected across the coil windings are mounted on the deflection coil assembly and their purpose is to damp any resonances set up in the coils due to shock-excitation from the neighbouring line coils.

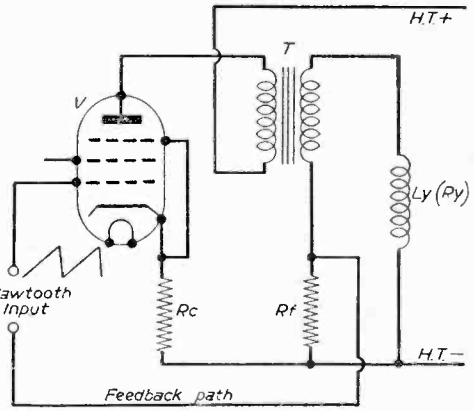


Fig. 22.—Linearisation by the use of negative feedback.

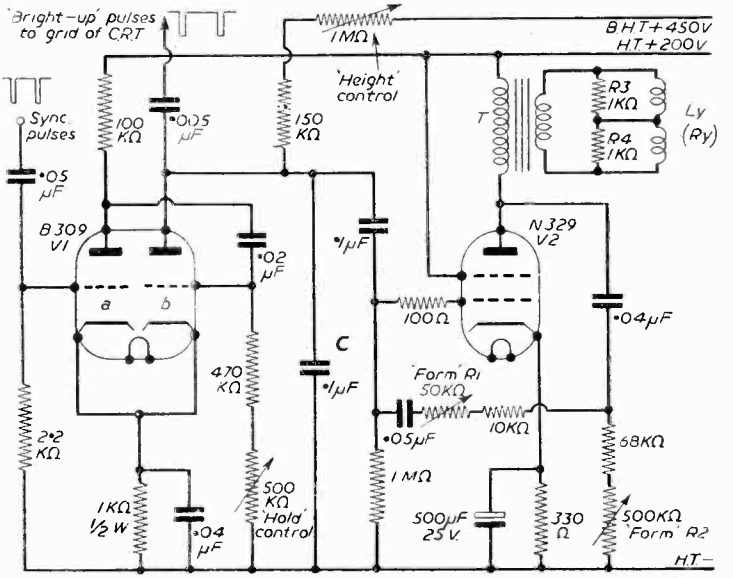


Fig. 23.—Complete scanning circuit for frame deflection of a wide-angle tube. Resistors are ½ w. unless stated otherwise.

Transformer Construction

A transformer designed to match these coils to the output is illustrated in Fig. 24 on page 162. One or two features about the construction of this transformer deserve comment. Owing to the large number of turns necessary for the primary winding it is important to choose a good quality enamelled wire so that the tragedy of short-circuited turns occurring early in the winding operation be avoided. A suitable wire for this purpose is manufacted by the London Electrical Wire Company under the trade name of "Lewmex." The transformer is pile-wound between cheeks and, in the absence of a coil-winding machine the use of a hand-drill

(*Continued on p.* 188)

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

By L. Lawry-Johns

(*Continued from page 112, October issue*)

No Picture

ADVANCE brilliance. If no raster is displayed, check for EHT at tube anode. If there is no spark, inspect line output section. Check for spark at the anode of R19 valve and notice whether this is lighting up. If it isn't, and there is no spark, check the 250 mA fuse and line timebase valves V13, 14 and 15. If there is no whistle at all, and the valves are in order, check line linearity control and line blocking oscillator transformer windings, ensuring that H.T. is present on V13 anode (pin 6).

If a raster is displayed, but no picture can be resolved, check valves V3, 4, 5 and 6 and then the V6 cathode bias components. It will be seen that the 220Ω resistor also carries a steady current due to R84 (18 KΩ). If this latter resistor decreases in value, the excess current through the 220Ω not only biases off V6 but also causes this resistor to become open circuit. On the other hand it may cause the resistor to short out completely or the excess voltage may cause C20 (25 μF) to short, thereby causing V6 to be underbiased and poor definition to result. This, of course, does not come under the heading of "no picture."

No Sound, No Picture

Advancing brilliance displays raster and volume control causes valve noise to be heard. Check V1 and V2, aerial and connections. If all is in order, check 22 KΩ resistor wired to pin 7 of V2. If there is no noise from the speaker and no raster can be displayed, check the H.T. voltage, assuming, of course, that all the valve heaters are glowing, and if low check for shorted components. A convenient H.T. check point is the 250 mA fuse.

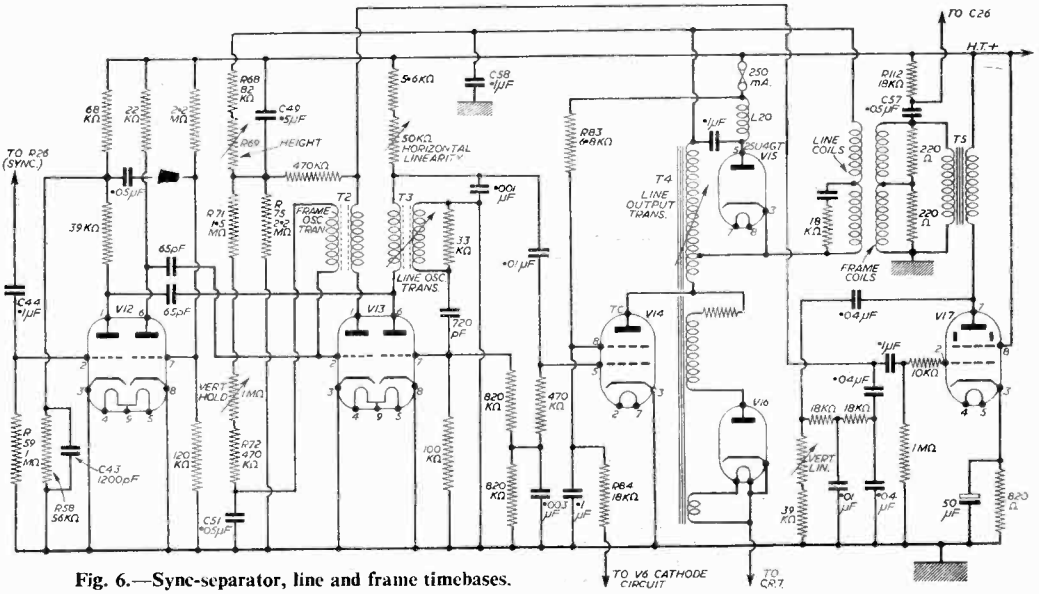
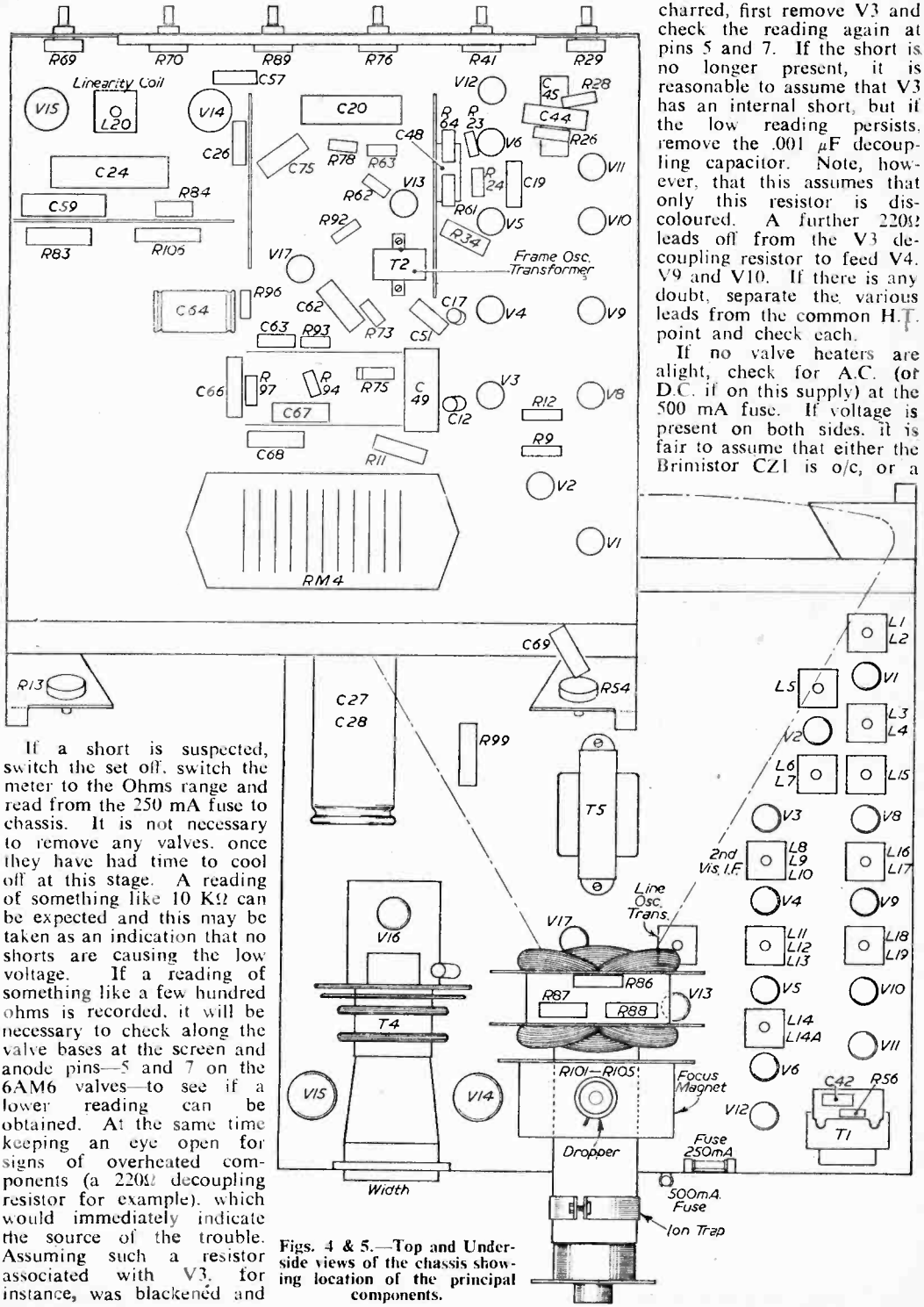


Fig. 6.—Sync-separator, line and frame timebases.



Figs. 4 & 5.—Top and Underside views of the chassis showing location of the principal components.

If a short is suspected, switch the set off, switch the meter to the Ohms range and read from the 250 mA fuse to chassis. It is not necessary to remove any valves, once they have had time to cool off at this stage. A reading of something like 10 KΩ can be expected and this may be taken as an indication that no shorts are causing the low voltage. If a reading of something like a few hundred ohms is recorded, it will be necessary to check along the valve bases at the screen and anode pins—5 and 7 on the 6AM6 valves—to see if a lower reading can be obtained. At the same time keeping an eye open for signs of overheated components (a 220Ω decoupling resistor for example), which would immediately indicate the source of the trouble. Assuming such a resistor associated with V3, for instance, was blackened and charred, first remove V3 and check the reading again at pins 5 and 7. If the short is no longer present, it is reasonable to assume that V3 has an internal short, but if the low reading persists, remove the .001 μF decoupling capacitor. Note, however, that this assumes that only this resistor is discoloured. A further 220Ω leads off from the V3 decoupling resistor to feed V4, V9 and V10. If there is any doubt, separate the various leads from the common H.T. point and check each.

If no valve heaters are alight, check for A.C. (or D.C. if on this supply) at the 500 mA fuse. If voltage is present on both sides, it is fair to assume that either the Brimistor CZ1 is o/c, or a

valve heater (including tube) has failed. Note however, that this will not prevent D.C. being present at the 250 mA fuse. If no voltage is present at the 500 mA only, check the mains dropping resistor 66 ohm elements. If no voltage is present at either fuse, either the mains dropper is o/c on more than one section, the on/off switch is defective, or there is no mains being applied to the on/off switch.

Poor Picture

The effects of a failing tube have been so often described that it is not proposed to repeat them. However, if symptoms resembling those of a low emission tube are displayed and yet a white, well-focused raster can be resolved regardless of the picture, suspect the V6 video amplifier anode load resistor (pin 5, 9.1 KΩ) which may well have changed value. Where the picture is just lacking in contrast, i.e., weak and of poor sync, check the valves, associated resistors, etc., from V1 to 6, including the cathode components of this latter valve.

VALVE TYPES

V1—R.F. AMP 6BW7	V13—12AU7
V2, 3, 4, 6, 8, 9 & 11—6AM6	V14—50CD6
V5 and 10—6AL5	V15—25U4GT (See Text)
V12—12AT7	V16—R19
	V17—9BW6

Tube Replacement

It is quite in order to replace the Brimar or Ferranti tube with a Mullard MW 36-24. The Brimar and Mullard tubes require an ion trap magnet, as shown in our diagram of the top chassis, but the Ferranti tube has a straight gun assembly and thus does not require such a magnet.

MODIFICATIONS

Poor Sync

If parts of the picture move horizontally with changes of scene or picture content, change C22 (.005 μF) to 720 pF and R26 (22 KΩ) to 10 KΩ.

Sensitivity

In areas of low signal strength, the sensitivity may be improved by removing R9 6.2 KΩ resistor and changing R12 (8.2 KΩ) to 10 KΩ. Also re-tune the 2nd vision I.F. iron core by screwing transformer bottom dust inwards one turn.

Uneven Brilliance

On early models some variation in brilliance between the top and bottom of the raster was caused by the frame flyback blanking circuit. Later models incorporate C57 (.05 μF) and R112 (18 KΩ) to overcome this effect. These components are shown in the timebase diagram.

Television Searches for Wreckage

FOR the first time in the history of underwater salvage a grab fitted with an underwater television camera has been used to recover wreckage from a crashed aircraft at a depth of 680ft.—280ft. below the depth at which the search for the Comet which crashed off Elba was conducted.

This has been achieved in Lake Constance, Switzerland, during the recovery of pieces of a Swiss DC3 which crashed into the lake, with the loss of nine lives, during a training flight on June 18.

The TV grab was fitted with a camera loaned by Pye of Cambridge, which was of the type used during the Comet search.

The approximate area in which the wreckage was lying, 680ft. down, was established from eye witness accounts. Observations from a helicopter later located the exact spot, when oil was sighted on the surface. The area was then marked accurately by buoys.

Early in the search Colonel Hoegger in charge of the search descended to the bottom of the lake in a bathyscope to find that forward visibility at the bottom did not exceed 10ft. He also found that the bathyscope when touching the ground stirred up so much of the deep mud (slick sand), that the visibility dropped temporarily to zero and the danger of the bathyscope getting caught in parts of the wreckage became so great that its use was abandoned. The decision to use underwater television was then taken.

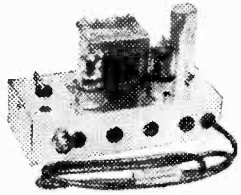
The underwater camera, operated by Pye technicians, was brought into action, and within a very short time a very substantial proportion of the wreckage was sighted, and photographs taken from the TV monitor screen.

The method of search was as follows. On arrival at the area of the wreckage, the ferry was towed slowly up and down by two launches. During the day a salvage company trawled the area with steel hawsers, which were wound round parts of the wreckage, and then brought to the surface. This was a laborious and somewhat unreliable method; it resulted in additional mutilation of the wreckage, and on the average it took approximately one day to land a piece of wreckage.

To obviate this slow progress, it was decided to make a grab attachment for the underwater television camera, so that observation and recovery of the wreckage could be carried out in one process. On the 5th August, for the first time ever in underwater salvage, a television grab was trawled at a depth of 680ft. below the surface —280ft., deeper than the Comet recovery had been conducted.

The procedure adopted while searching with the television grab was for the crane operator to watch the television monitor, for wreckage coming towards the grab, the arms of which were visible at the top of the picture. As the wreckage passed immediately below it the one ton grab was dropped on to the wreckage and the arms automatically clasped it. At the same time more cable was paid out to allow for drift as the ferry overshot the spot.

Within minutes the wreckage was hauled to the surface, secured and brought back to the shore.



BAND 3 T/V CONVERTER
185 Mcs—199 Mcs

Suitable London, Birmingham, Northern and Scottish ITA Transmissions

Mk. 2 Model, as illustrated. Latest Cascode circuit using ECC84 and EF80 valves giving improved sensitivity (12 db.) over standard circuits, built-in Power Supply A.C. 200-250 v. Dimensions only 6½in. x 3in. Ht. 4in. Simple and easy to fit—only external plug-in connections. **Wired, aligned and tested ready for use. State Channel Required. Guar. Bargain Offer—good results or full refund, only**

£3.19.6. Carr. & Pkg. 2/6.

Mk. 1 Model. Using 2 8D3s or EF80s. Full constructor's Kit of Parts including drilled chassis, 7in. x 4in. x 2½in., blueprint, valves and all components, etc., excluding Power Supplies to modified W.W design. Many 100's in satisfactory use. **Bargain Offer only 2 gns.** P. & P. 2/6. Power Supply Kit, complete, 20/-. P. & P. 1/6. Band 1-Band 3 Switch Kit, 6/6.

CONVERTER ACCESSORIES. Band 1-Band 3 Cross-over Unit, 7/6. Var. Attenuators 6db-36db, 6/9. BBC Pattern Filter, 8/6. Band 3 Aerials—outside single dipole with 4 yds. coax., 13/9. 3 element Beam, 27/6. 5 element, 35/-, etc., etc.

Volume Controls

Log. ratios, 10,000 ohms —2 Megohms. Long spindles. 1 year guarantee. Midget Edis-wan type.

No. Sw. S.P. Sw. D.P. Sw.
3/- 4/- 4/9

Linear Ratio, 10,000 ohms — 2 Megohms. Less switch, 3/- each.

Coax plugs, 1/2. Coax sockets, 1/-. Couplers 1/3. Outlet boxes, 4/6.

TWIN FEEDER, 80 ohms, 6d. yd. : 300 ohms, 8d. yd.

TWIN SCREEN FEEDER, 80 ohms. 1/3 yd.

50 OHM CABLE, 8d. per yd. ¼in. dia.

TRIMMERS, Ceramic, 4 pf.–70 pf., 9d. 100 pf., 150 pf., 1/3 ; 250 pf., 1/6 ; 600 pf., 1/9. **PHILIPS** Beehive Type—2 to 8 pf. or 3 to 30 pf., 1/- each.

RESISTORS.—Pref. values 10 ohms 10 megohms.

CARBON		WIRE WOUND	
20% Type, ½ w., 3d. ; 1 w., 5d. ; 2 w., 9d.	5w.	25 ohms—1/3	
	10w.	10,000 ohms	1/6
	15w.		2/-
10% Type, ½ w., 9d. ; 1 w., 1/- ; 2 w., 1/6	5w.	15,000— 20,000 ohms	1/9
	10w.		2/3
5% Type, ½ w., 1/- ; 1 w., 1/6			
1% Hi-Stab, ½ w., 2/-			

WIRE-WOUND POTS. Pre-Set Min. T.V. Type Knurled Slotted Knob. All values 25 ohms to 30 K., 3/- ea. 50 K., 4/-. Ditto Carbon Track, 50 K. to 2 Meg., 3/-.

SOLON SOLDERING IRONS (200-220v. or 230/250 v.). 25 watt Instrument Type, 21/6 ; 65 watt Pencil Bit Type, 26/8 ; 65 watt Oval Bit Type, 25/-. Comprehensive stock of spares available.

SPEAKER FRET.—Expanded Bronze anodised metal 8 x 8 in., 2/3 ; 12 x 8 in., 3/- ; 12 x 12 in., 4/3 ; 12 x 16 in., 6/- ; 24 x 12 in., 8/6, etc.

TYGAN FRET (Murphy pattern) 12 in. x 12 in., 2/- ; 12 x 18 in., 3/- ; 12 x 24 in., 4/-, etc.

80 ohm CABLE COAX

STANDARD ¼in. diam. ☆ Polythene insulated. GRADE "A" ONLY

8d. yd.

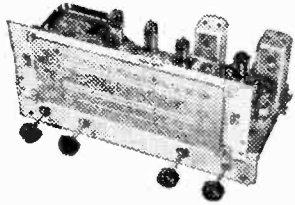
SPECIAL — Semi-air spaced polythene. 80 ohm. **Coax.** ¼in. diam. Stranded core. Losses cut 50%.

9d. yd.

Ideal Band 3.

8" P.M. SPEAKER (3 ohms)

Ex M/rs'. Units : Rola, W.B., Celestion, etc. All reconditioned and guaranteed. Ideal Ext. Unit. Bargain, 7/6. Carr. 1/6. Ditto with O/P Trans. 9/6.



ALL WAVE RADIOGRAM CHASSIS
3 WAVEBANDS 5 VALVES

S.W. 16 m.—50 m. LATEST MIDGET
M.W. 200 m.—550 m. BVA
L.W. 800 m.—2,000 m. SERIES

Brand new and guar. A.C. 200/250 v. 4 pos. W/C. sw. Short-Medium-Long-Gram. P.U. socket. High Q dust core coils. Latest circuit technique, delayed AVC and neg. feedback. O/P 4 watts. Chassis size, 14½ x 5½ x 2½in. Dial 10in. x 4½in. Hor. or vert. station names. Walnut or ivory knobs to choice. Aligned and calibrated ready for use. **Sensitivity and Quality at Low Cost.** Double wound mains trans. **BARGAIN PRICE 9½ gns.** Carr. and ins., 4/6.

8 or 10in. speaker to match, 20/- and 25/-.

7 Valve De Luxe, push-pull EL41 version, 7 watt output with H/Duty Trans. **£12.10.0.** Carr. & ins. 5/-.

RECORD PLAYER BARGAINS

SINGLE PLAYERS.—3 sp. BSR (TU8), 92/6 ; 4 sp. BSR (latest model, TU9), 99/6. 4 sp. COLLARO, 5 gns. 4 sp. GARRARD (4 S.P.), £7.10.0. Carr. & ins., 3/6.

AUTO CHANGERS.—3 sp. COLLARO (RC54), £7.19.6. 4 sp. BSR (UA8), £8.15.0. 4 sp. COLLARO, £9/15/-. 4 sp. GARRARD, 9½ gns. Carr. & ins., 4/6.

All above models Brand New and Guar. Fitted latest style Tweight Xtal. P.U. with turnover head and twin sapphire stylii.

SPECIAL OFFER.—GARRARD 6 v. Battery operated single 45 r.p.m. Record Player with Tweight Xtal P.U. Ideal unit for battery portable use.

BARGAIN £5.19.6. Carr. & ins., 5/-.

RECORD PLAYER CABINETS

Contemporary style rexine covered cabinet in mottled red with cream interior. Size 18½ x 13½ x ht. 8½in., fitted with all accessories, including speaker baffle board and plastic fret. Space available for all modern amplifiers and autochangers, etc. Uncut record player mounting board 14 x 13in. Cut mounting boards available.

Cabinet Price, **£3.3.0.** Carr. and in. 3/6.

2 VALVE AMPLIFIER (to fit above cabinet), modern circuit with EL84 output, ready built, with 6in. speaker and output transformer. £3.12.6, carr. and ins. 2/6.

WEARITE "P" TYPE COILS.—All ranges 1 to 7, 2/6 ea. Osmor Q series coils. Slug tuned. All ranges from 3/6. Med. & L.W. dual range coil with reaction, type DBR2 with circuits, 4/-.

I.F. TRANSFORMER—465 kc/s.

Brand new ex-manufacturer's midget I.F.T., size 2½in. x ¾in. x ¾in. dust core tuning. Litz wound coils, High Q. Bargain offer, 7/6 pair.

CONDENSERS.—Mica or S. Mica. All pref. values. 3 pf. to 680 pf., 6d. ea. Ceramic types, 2.2 pf. to 5,000 pf., 9d. each. Tubulars, 450 v., Hunts and T.C.C. .0005, .001, .005, .01 and .1, 350 v., 9d. .02, .5, .1/500v. Hunts, TCC, 1/-. .25 Hunts, 1/6. .5 Hunts, 1/9. .1, 1,500 v. T.C.C. (Simplex), 3/6. .001 6 kV. T.C.C., 5/6. .001 20 kV. T.C.C., 9/6.

SILVER MICA CONDENSERS—
10% 5 pf. to 500 pf., 1/- ; 600 pf. to 3,000 pf., 1/3.
1% 1.5 pf. to 500 pf., 1/9. 545 pf. to 5,000 pf., 2/-.

SPEAKERS.—PM 3 ohm, 2½in. Elac, 16/6 ; 5¼in. Goodmans, 18/6 ; 5in. R.A., 17/6 ; 6in. Celestion, 18/6 ; 7 x 4 Goodmans, 18/6 ; 8in. Elac, 20/- ; 10in. R.A., 25/- ; 12in. Plessey 35/-.

JASON F.M. TUNER UNIT (87 mc/s-105 mc/s). As described in Radio Constructor. Designer Approved Kit of parts to build this modern highly successful unit, drilled chassis and superior type illuminated glass dial, coils, cans and all quality components etc., for only 5 gns., post free. Set of 4 Specified Miniature Valves, 30/-, post free. Illustrated handbook with full details, 2/-, post free.

2-DAY ALIGNMENT SERVICE NOW AVAILABLE.

VALVES

NEW BOXED				ALL GUARANTEED	
1R5, 1T4	7/6	DAF96	9/-	ECL80	10/6
1S5, 1S4	7/6	DF96	9/-	EF41	10/6
3S4, 3V4	8/-	DK96	9/-	EF80	10/6
5Z4	9/6	DL96	9/-	EF86	12/6
6AT6	8/6	35L6	10/6	EF91	8/6
6K7	6/6	EABC80	9/6	EL41	10/6
6K8	8/6	6B91	6/8	EL84	11/3
6Q7	8/6	EBC41	10/6	EY51	10/6
6SN7	8/6	ECC83	9/6	EZ40	8/6
6V6	7/6	ECC84	12/6	EZ80	8/6
6X4	7/6	ECF80	12/6	MU14	9/6
6X5	7/6	ECF82	12/6	PCC84	10/6
7C5	9/-	ECH42	10/6	PCF80	10/6
7Y4	8/6	ECH81	10/6	PCF82	10/6

PL83	12/6				
PL81	11/6				
PL82	10/-				
PL83	11/6				
PY80	9/6				
PY81	9/6				
PY82	8/6				
U22	8/6				
U25	11/6				
UBC41	9/6				
UCH42	10/6				
UF41	10/-				
UL41	10/6				
UY41	8/6				

SPECIAL PRICE PER SET

1R5, 1T4, 1S5, 1S4 or 3S4	...	...	27/6
DK96, DF96, DAF96, DL96	...	...	35/-
6K8, 6K7, 6Q7, 6V6, 5Z4 or 6X5	...	...	35/-

ELECTROLYTICS ALL TYPES NEW STOCK

Tubular Wire Ends		Can. Types, Clips 3d. ea.	
25/25 v., 50/12 v.	1/9	8/450 v.	2/6
50/50 v., 4/500 v.	2/-	8—8/450 v. T.C.C.	4/6
100/25 v., 2/450 v.	2/-	8+16/450 v. Hunts	5/-
8/450 v. B.E.C.	2/3	16+16/450 v. T.C.C.	5/6
8/500 v. Dub.	2/9	32/350 v.	4/-
8+8 500 v. Dub.	4/6	32+32/275 v. Hunts	4/6
8+16 450 v. T.C.C.	5/-	32+32/450 v. T.C.C.	6/6
16/450 v. B.E.C.	3/6	250/350 v. B.E.C.	8/3
16/500 v. Dub.	4/-	60/350 v. T.C.C.	6/6
16+16/450 v. T.C.C.	5/6	60+100/350 v.	11/6
32/350 v. Dub.	4/-	64+120/275 v.	11/8
32/500 v. Dub.	5/-	60+250/275 v.	12/3
50+50/350 v. B.E.C.	6/6	100+200/275 v.	12/6
32+32/350 v. B.E.C.	5/6	3,000 mfd. 6 v.	3/3

TRANSISTOR.—Midget electrolytics, 2 mfd., 4 mfd., 8 mfd., 6 v., 3/6. 6 mfd., 10 mfd., 16 mfd., 3 v., 3/3. 32 mfd., 14 v., 3/6.

SENTERCEL RECTIFIERS. E.H.T. TYPE FLY-BACK VOLTAGES.—K3/25 2 kV., 5/- ; K3/40 3/2 kV., 6/9 ; K3/45 3.6 kV., 7/3 ; K3/50 4 kV., 7/9 ; K3/100 8 kV., 13/8, etc.

MAINS TYPES.—RM1 125 v., 60 mA., 4/9 ; RM2 125 v. 100 mA., 5/6 ; RM3 125 v. 120 mA., 7/6 ; RM4 250 v., 250 mA., 16/- ; RM4B Type 270 mA, 17/6. RM5, 250 v. 300 mA. 21/-

MAINS TRANSFORMERS.—Made in our own Workshops to Top Grade spec. Fully interleaved and impregnated. **RADIO AND AMPLIFIER TYPE.**—250 v., 60 mA. F.W. rec. 5 v. or 6.3 v. 1 a. rect. 6.3 v. 2.5 a. set Htrs., 22/6, etc., **C.R.T. HTR.**

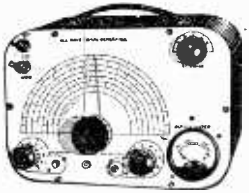
ISOLATION TYPE.—Low leakage with or without 25% sec. boost voltage. Ratio 1 : 1 or 1.25. 2 v., 10/6 ; 4 v., 10/6 ; 6.3 v., 10/6 ; 13.5 v., 10/6. Ditto with mains primaries 200/250 v., 12/6.

SPECIAL TRANS.—Wound to your requirements.

TRANSISTORS

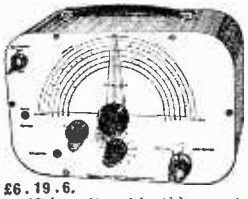
Min's. surplus PNP Junction type.
Audio Type, 800 Kc/s, 250 m.w.. 9/6.
R.F. and L.O. Mixer Type, 2.5 Mc/s. 19/6.
All tested and guaranteed.
Transistor Components.—Midget I.F. transf. 315 kc/s. 5/- ; Ferrite Slab Aerial (dual range), 13/6 ; M. and L.W. Osc. and 1st I.F., 11/6 ; Push Pull interstage transf., 8/6 ; Push Pull output transf., 8/-.
M/Coil Earpiece, 2in. diam., 150 ohm. **4/9.**
Bal Arm. Phone Inserts, 1¼in., 50 ohm. **3/9.**

SIGNAL GENERATOR



Coverage 120 Kc/s-230 Kc/s. 300 Kc/s-900 Kc/s. 900 Kc/s-2.75 Mc/s. 2.75 Mc/s-8.5 Mc/s. 8 Mc/s-28 Mc/s. 16 Mc/s-56 Mc/s. 24 Mc/s-84 Mc/s. Metal case 10in. x 6¼in. x 4¼in. Size of scale, 6¼in. x 3¼in. 2 valves and rectifier. A.C. mains 230-250 v. Internal modulation of 400 c.p.s. to a depth of 30 per cent., modulated or unmodulated R.F. output continuously variable 100 milli-volts. C.W. and mod. switch, variable A.F. output and moving coil output meter. Grey nammer finished case and white panel. Accuracy plus or minus 2%. **£4.19.6.** or 34/- deposit and 3 monthly payments 25/-. P. & P. 4/6 extra.

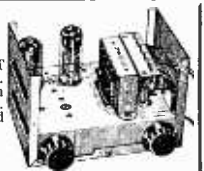
SIGNAL & PATTERN GENERATOR



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

£6.19.6.
Or £2 deposit and 4 mthly. pymts of 27/6. P. & P. 5/6.

COMMERCIAL TELEVISION CONVERTER SUITABLE ANY T.V. EXCEPT PHILIPS ALL CHANNELS NO ALTERATIONS TO SET



Complete with built-in power supply. 230-250 v. A.C. mains. Crackle finish case 5¼in. long. 3¼in. wide. 4¼in. high. Incorporating gain control and band switch. Illus. with cover removed.

£3.19.6 Plus P. & P. 2/6.

3 element folded dipole I.T.A. loft AERIAL, 15/-. P. & P. 2/-. Co-ax cable, 8d. yard.

H.P. TERMS AVAILABLE

AC/DC MULTI-METER KIT

Comprising 2in. moving coil meter, scale calibrated in AC/DC volts, ohms and milli-amps. Voltage range AC/DC 0-10, 0-100 and 0-500. Milli-amps 0-10, 0-100. Ohms 0-1,000 and 0-10,000. Front panel, range switch, wire-wound pot (for ohms zero setting) two toggle switches, resistors and metal rectifier. In grey hammer-finish case. **19/6** Plus P. & P. 1/6.

Point to point wiring diagram 1/-, free with kit.

4 VALVE ALL-DRY SUPERHET PORTABLE KIT

incorporating Ferrite rod aerial

Medium and long waves. In grey leatherette. Size 9in. x 7in. x 6in. Valve line-up: 1T4, 1R5, 1S5, 3V4. Complete kit of parts (less batteries).

£5.19.6 Plus Post & Packing 3/6

COMPLETELY BUILT PORTABLE AMPLIFIER approx. size 6¼in. x 2¼in. incorporating 2 valves, contact-cooled metal rectifier, bass and treble lift controls **39/6** Plus P. & P. 3/6. and double wound mains transformer 230-250 v. **5in. P.M. SPEAKER & O.P. TRANSFORMER,** if purchased with the above. **18/6.** Plus P. & P. 1/6.

COLLARO 4-SPEED AUTOMATIC CHANGER

Model 456 (suitable for use with above amplifier). A.C. mains. 200-250 v.. turnover crystal head. **£8.19.6** Plus P. & P. 5/-. Brand new, fully guaranteed. Or £3 deposit plus P. & P. 5/- and 6 mthly. payments of **£1.4.0.**

RADIO & T.V. COMPONENTS (Acton) LTD.

23, HIGH STREET, ACTON, LONDON, W.3

GOODS NOT DESPATCHED OUTSIDE U.K.

TELEVISION TUBES

RECLAIMED GUARANTEED:
12"—£6 14"—£5 17"—£7.10.0

FULLY GUARANTEED HIGH QUALITY REBUILT:
12"—£9 14"—£11.10.0 15"—£12 17"—£13.10.0

CARRIAGE AND INSURANCE 15/6 EACH TUBE

MAIL ORDER ONLY

PRIME ELECTRICS
36 QUEENSDALE ROAD, W.11.

LINE OUTPUT TRANSFORMERS

Most types available. State Make and Model Number of Receiver when ordering.

S.A.E. please with all enquiries.

HOWORTH

51 POLLARD LANE, BRADFORD, 2, YORKS

Tel. 37030

EDDY'S (Nottm.) LTD.

(DEPT. P.T.)

172 ALFRETON ROAD, NOTTINGHAM

THIS MONTH'S SPECIAL OFFERS

CAR RADIO AERIALS, 26/11. Postage, etc., 1/6 extra. Brand new, complete with lead. Telescopic, best quality chrome. Please state side or wing fitting.

GOGGLES. Ideal for Motor Cycles, etc. 1/- each, postage, etc., 6d.

SINGLE PIECE THROAT MIKES, 1/- each. Post, etc., 6d. Could be used for electrifying Musical Instruments.

PERISCOPES, 6/11 each. Postage, etc., 2/- extra.

Any parcel insured against damage in transit 6d. extra.

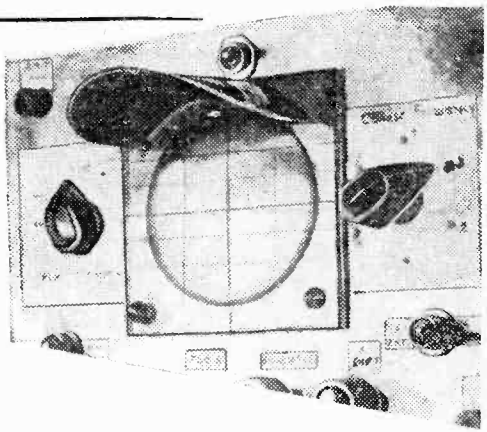
NEW AND GUARANTEED VALVES

Post, etc., 6d. per valve. Over £2 Free.

AZ1	12 11	EF80	8/3	U25	13 6	3V4	8/6	7C5	8 11
CY31	12 11	ECH42	9/6	UBF80	9 6	5Z4G	9/6	7C6	8 11
DAF96	9/6	ECF80	12/6	UBC41	8 11	5Y3GT	7/6	7S7	9 11
DF96	9 6	ECF82	12 6	UCH42	9 11	6BA6	6/6	7Y4	7 11
DL96	9 6	EF40	10/11	UF41	8 11	6B8G	3/6	10F9	11 6
DK96	9/11	EF41	9/6	UF42	13 6	6BJ6	7/11	12Q7G	7 11
DM70	7 11	EF86	12/6	UL41	9 11	6F1	13/6	14S7	12/11
EABC80	7/6	EF89	9/11	UY41	7 11	6J5GT	3/11	25A6G	12 6
EB91	6/6	EF91	6/11	1A7G	13 6	6F15	14/-	25Z4G	8 11
ECC81	8/11	EL84	9/6	1C5G	10/6	6K7G	2/11	35A5	10/6
ECC82	8/11	EZ80	8/3	1H5G	10/6	6K8G	8/6	35W4	8 11
ECC83	8/11	GZ32	12/6	1N5G	10 6	6Q7G	8/3	35Z4G	7 11
ECC84	10/11	PL82	8/11	1R5	7 11	6Q7GT	8/11	35L6GT	
ECC85	8/11	PL83	11/6	1S5	7 3	6U4GT			9/11
ECH35	9/11	PY80	8/11	1T4	7 3		13/11	954	1 6
ECH81	8/11	PY81	8/6	3Q4	9 11	6V6GT	5/11	955	3 11
ECL80	8/11	PY82	8/6	3Q5	10 11	6X5GT	7/6	956	2 6
				3S4	8 11	7B7	8/11	958	3 11

TRADE ENQUIRIES INVITED. C.O.D. or C.W.O. ONLY

THE OSCILLOSCOPE AND TV SERVICING



By F. E. Apps

IT is a remarkable fact that many television service departments have an oscilloscope that is an expensive ornament to the department, but as regards its use, well, it just remains an ornament. Many service engineers would sooner rely on output meters for making tests, and cannot be bothered to set up the oscilloscope for this purpose. The writer maintains that this is the wrong attitude to take. An oscilloscope for correct alignment of both R.F. and I.F. and for complete check of timebase circuits, flywheel sync, and A.G.C. circuits, is a necessity, if accuracy and quickness of working is desired. A visual indication on the oscilloscope is much to be preferred to a set of data derived from output meter readings. Another point is that practically all manufacturers give on their service sheets, video and timebase waveforms which can be followed by the service engineer, only if he is using an oscilloscope.

Intermediate Frequency Alignment

The correct I.F. response pattern can be accurately achieved if an oscilloscope, which is connected to the sync output of a television wobbulator, with a marker generator loosely coupled, is used. The signal from wobbulator to be injected into the I.F. channel and the oscilloscope connected to the video detector. A typical I.F. response curve is given in Fig. 1, although it must be appreciated that it will differ slightly for various makes, owing to different I.F. frequencies used. The shape itself will not differ much.

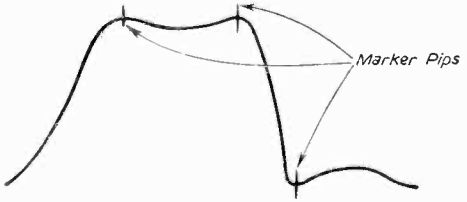


Fig. 1.—A typical I.F. response curve.

R.F. Alignment

The general run of present day television receivers (leaving out the tuning unit, if extra) consists of a R.F. amplifier and a frequency changer or an oscillator and mixer. Now as practically all sweep generators have an output of 70 to 80 ohms impedance, and television receivers have either a 300 ohm balanced input or a 70 to 80 ohm unbalanced input, it is necessary, if the receiver happens to be of the first type, that a matching device must be used unless serious mismatching is to occur (see Fig. 2). The reason for this being necessary is that the input tuning circuits of a television receiver contribute to the shape of the overall R.F. response curve, and when proper matching is not employed between instrument and receiver the tuning curve of this input circuit is affected. The sweep generator is connected to the receiver input terminals and the oscilloscope to the video detector or grid of video amplifier (most receivers have a test point on them connected here for the oscilloscope connection). A marking generator should be loosely coupled to the sweep generator. The oscilloscope sync coupled to the sweep generator. If A.G.C. is fitted to receiver, either earth this or connect a 3 volt battery into the main A.G.C. lead with positive terminal of battery to chassis. When the set has thoroughly warmed up the trimmers or slugs should be adjusted until an overall pattern is shown on oscilloscope, similar to one given by makers. A typical curve is shown in Fig. 3.

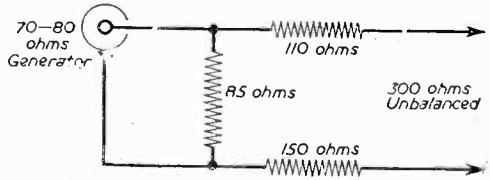


Fig. 2.—A matching device.

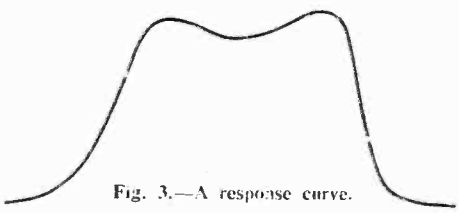


Fig. 3.—A response curve.

Timebase Circuits

For checking faults in timebase circuits the oscilloscope is the best instrument to possess. With it one can examine the whole of a timebase circuit and examine wave form from the oscillator up to the deflection coil.

Most manufacturers give a series of patterns that can be expected at different points in a timebase circuit. A few typical forms are shown in Fig. 4.

Sync Separator

The best way to check through a sync circuit that is faulty is by tuning in a signal and then with an oscilloscope to check pulse waveforms at the grid and anode of each sync stage (if more than one). A few typical waveforms are given in Fig. 5. The point to start at is the input to the sync separator, here will be generally found the video signal complete with video voltage and sync pulses. It will be found that on the oscilloscope the horizontal pulses will stand out much clearer than the vertical pulses. In observing these waveforms it is important to notice whether the sync pulses have been compressed, this is often found where it is difficult to keep picture in sync. If this is so, it is possible that trouble is not in sync separator stage at all, but in the preceding video section. The trouble could also be on the A.G.C. system (if used), so that controlled valves are being allowed to operate at higher than normal gain due to insufficient bias. This will lead to overloading and thus sync pulse compression.

In alignment, especially in the R.F. circuits of a superhet, where there is one oscillator frequency and two I.F.'s, one for vision and one for sound, without an oscilloscope, it is quite easy to line up on the wrong one of two setting adjustments.

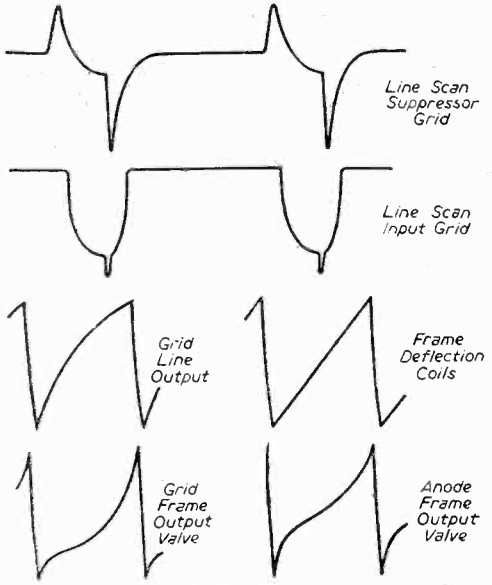


Fig. 4.—Some typical waveforms from the timebases.

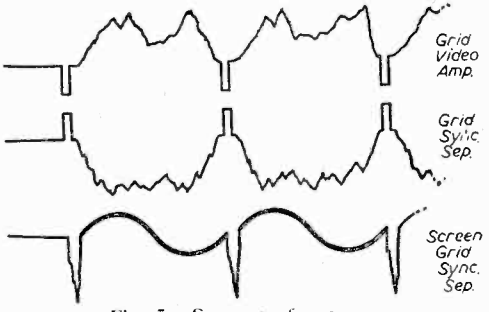


Fig. 5.—Sync waveforms.

St. Hilary Starts December 17

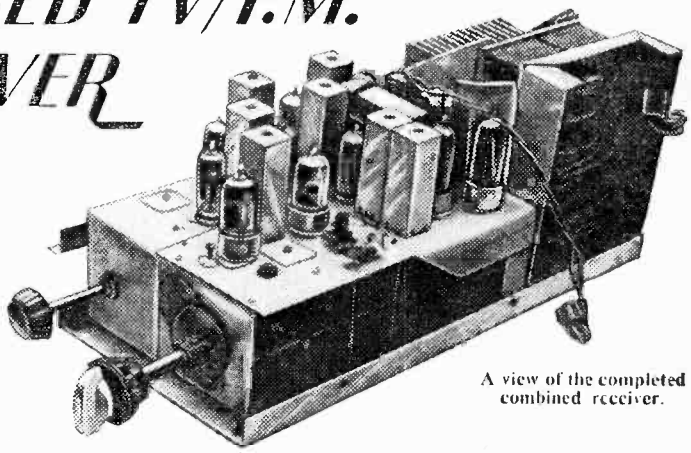
INDEPENDENT TELEVISION programmes will begin in South Wales and the West of England on the 17th of December. The programmes will be broadcast on Channel 10 from the new I.T.A. transmitting station at St. Hilary, near Cardiff, and over three and a quarter million people will be within its service area. All the programmes will be provided by T.W.W. Ltd. (Independent Television for South Wales and the West of England).

The area to be served will include the south of Pembrokeshire, the south of Carmarthenshire, Glamorganshire, Monmouthshire the south of Gloucestershire, Somerset and North Devon. It is estimated that a primary service will be provided for over two million people living in the area roughly bounded by a line drawn through Llanelly, Aberdare, Chepstow, Bristol, Wells, Glastonbury and Ilfracombe, and viewers there should receive a consistently satisfactory picture unless they are situated in particularly unfavourable positions. In the secondary service area, which will include Merthyr Tydfil, Bath, Taunton and Tiverton, a substantial proportion of viewers should receive a satisfactory service but in a few unfavourably situated places reception may be poor. The fringe area, where reception should be secured in many locations although it may be subject to some interference from time to time, should embrace Pembroke, Milford Haven, Carmarthen, Llandilo, Monmouth, Chippenham, Frome, Wincanton, Yeovil, Barnstable and Bideford.

A SWITCHED TV/F.M. RECEIVER

A COMBINED TV AND BAND II SOUND RECEIVER

By R. Shatwell



A view of the completed combined receiver.

THE set to be described brings to the home constructor the latest development in the commercial television sets—switch tuned F.M. reception. It also utilises the now standardised I.F.s of 38.15 Mc/s for sound and 34.65 Mc/s vision. All coils and transformers are home constructed and its mechanical design is such that it can be mounted vertically or horizontally, either position providing excellent ventilation of the tuner and power supply.

The incorporation of F.M. into the TV set could be assumed to be an obvious development. The circuits to the end of the sound I.F. stages are similar, and the only changes from here are in the method of detection. The use of double I.F. transformers as in the sound broadcast band and F.M. set is avoided. Assuming that the F.M. stations are to be switch tuned and this is not the only method possible, the problem is that of stability of oscillator and of the I.F. channel. The bandwidth can be made reasonably broad to dispose of the channel drift, normally very slight, and the TV oscillator circuit needs compensation in any case, to maintain stability on Band III. In practice these problems gave no difficulty. The switching of the detector system involves only the removal of the TV I.F. transformer from the anode of the final I.F. valve and the insertion of the F.M. discriminator transformer, plus the connection of the L.F. stages to the appropriate demodulated signal. Special valves have been developed for this double

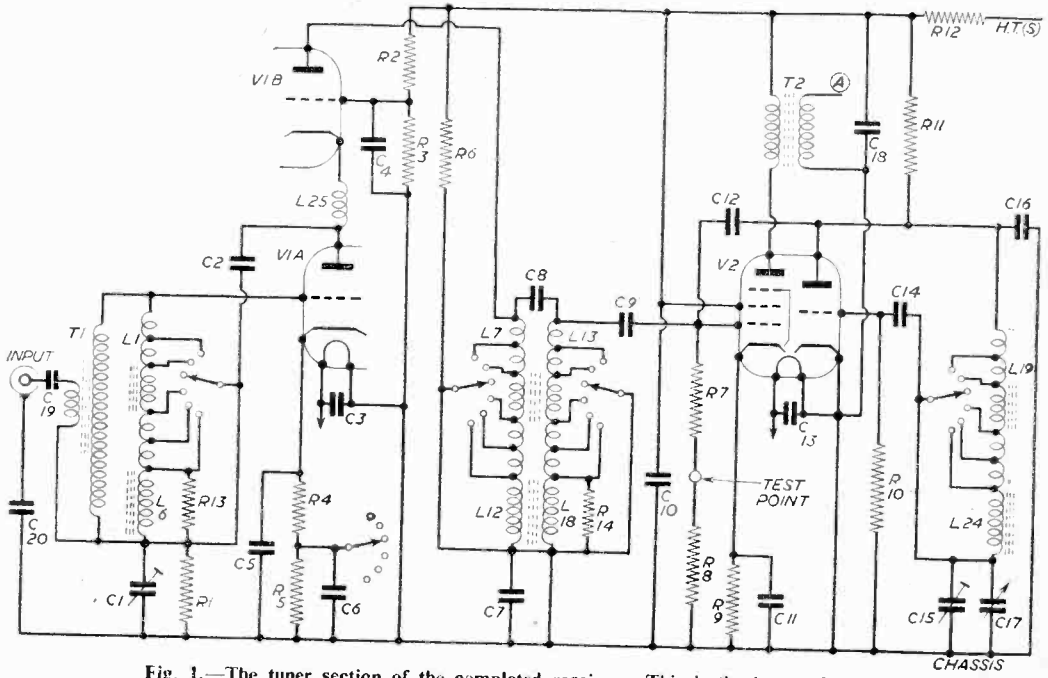
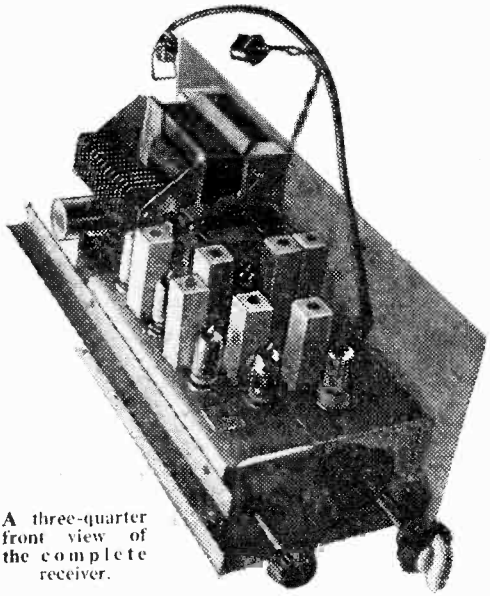


Fig. 1.—The tuner section of the completed receiver. This is the heart of the set.

function and save expense, space and wiring.

Ancillary problems arise in the need to render the video and timebase circuits inoperative, and at the same time keep the H.T. supply within the



A three-quarter front view of the complete receiver.

limit for the circuits still operative on F.M., and it is here that the home constructor, with no facility for having special components made, strikes the main problem. However, the arrangement to be described has proved excellent and over three months' exhaustive use no faults or problems arose.

The switching provides for two Band III positions, one Band I position and the Home, Third and Light programmes on F.M. and uses Yaxley type switches throughout, nine wafers being used. Of these, four deal with coil switching in an incremental arrangement, one with signal balancing, two with F.M./A.M. detector switching, and the last two with breaking the heater supply to the tube, and video and timebase circuits. It is due to this need that the power supply has been treated as part of the receiver although other advantages also accrue from this.

Normally, of course, only one Band III and a Band I station are available, but it may be possible to receive another Band III station at a later date and at present the blank position should be arranged on the first position on the switch, i.e., knob fully anticlockwise. The bandwidth is broad enough to make F.M. tuning simple and stable and in practice with care in setting up the oscillator direct switching to all positions is possible and stability is excellent. Even from cold no adjustment of F.M. is necessary and on Band III its only effect is visible as slight sound breakthrough for the first minute or two, after which the circuit remains stable. Sensitivity is superior to the normal converter arrangement and using loft aerials and a triplexer results have been excellent. F.M. is receivable without aerial, or on either TV aerial but is much improved by a correctly proportioned F.M. aerial. Similarly, either TV aerial can give results on all bands, but results are much better using the correct aerial for the band being received. A simple triplexer will be described.

Before proceeding further it must be appreciated that the set is definitely not for the tyro, and calls for some V.H.F. experience. The tuner unit contains some two dozen inductances, and the I.F. stages another seventeen. All are home constructed and are involved in a compact layout. In dealing with Band III it is often stated that a certain coil consists of, say, "2½ turns 18 s.w.g. spaced one eighth inch." This data would enable the person describing the coil to reproduce it exactly. However, ideas on ⅛in. spacing vary; the coil may be left with ends of ⅛in. to ¾in. and in fitting the coil may be stretched or compressed. These variations may be corrected by manipulation "in situ," but when a sequence of aerial R.F., F.C. and oscillator coils is involved, the total discrepancy can assume considerable proportions.

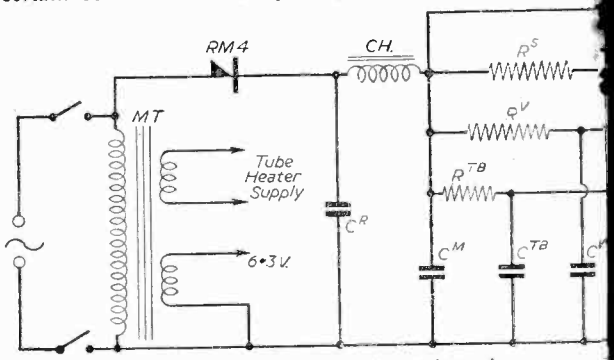


Fig. 4.—The power pack section.

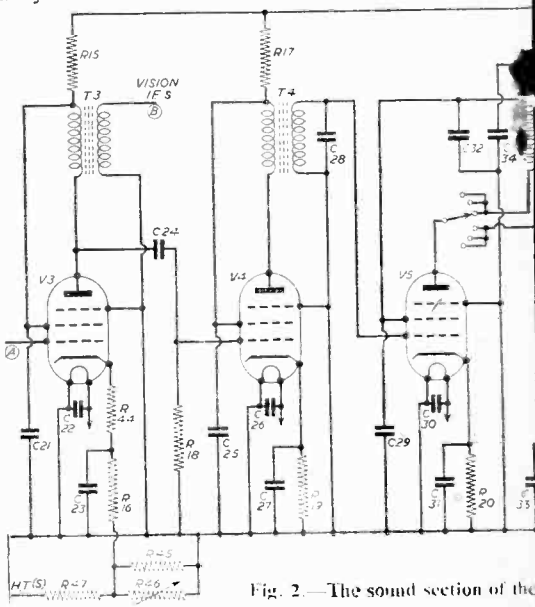


Fig. 2.—The sound section of the

and experiment is inevitable. Four banks of switching and a compact layout add further fields for the individual touch to make itself felt. It may be assumed that a signal generator covering the I.F.s at least is essential. These points have been made so as to avoid queries re turns necessary for Channel 8, 10, etc., a question it is not possible to answer. It is sufficient to say that the data given enables all present variants of combinations to be covered with a little patience. Bands II and I are provided with core tuning, and brass or dust cores can be used on these bands if necessary for the higher channels.

H.T. Max.

H.T.(S)

H.T.(V)

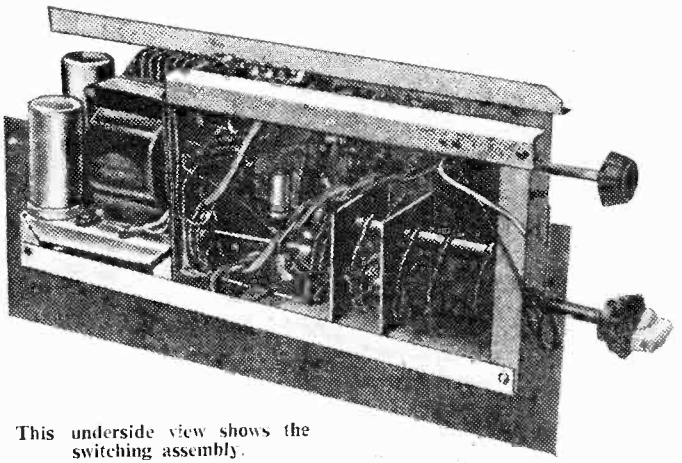
H.T.(TB)

C5

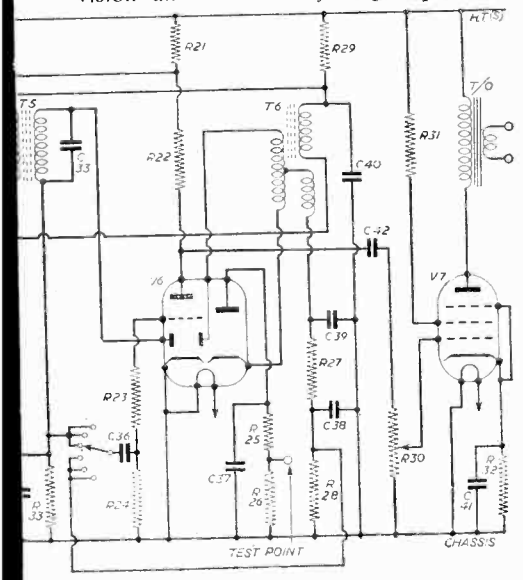
Chassis

The Circuit

After this warning to the inexperienced the circuit will be described. A cascode R.F. stage (ECC84) feeds an ECF82 frequency changer and oscillator stage (Fig. 1). Incremental switched tuning is used. Band III coils are self supporting, Bands I and II being on Aladdin formers ¼in. diameter. Combined transformer and capacity coupling is used between stages on the latter bands, and gives a wide band transfer of signal. The oscillator is compensated by C14 and C16, having a negative temperature co-efficient. The switching is arranged so that the Band III and I TV positions are adjacent, and these can be balanced to avoid contrast adjustment on change over. The I.F. stages (Figs. 2 and 3) use EF91s or 6AM6s and the first is common to sound and vision and is the only stage upon which the contrast control operates. There are two further sound stages and two vision stages. Half of a 6AL5 is used as vision diode and a 6CH6 as video amplifier providing a signal suitable for grid modulation of the tube. Cathode modulation would require reversal of the diode, increased bias to the 6CH6 and changes in the output dependent upon the sync stages, etc. The sound detection and first L.F. stage, on both A.M. and F.M., is provided by an EABC80 triple diode triode, and another 6CH6 is used for sound output. No "frills" exist at any stage and no need for them has been evidenced.



This underside view shows the switching assembly.



combined circuit. A list of parts will be found on p. 174.

Power Supply

The power supply (Fig. 4) for the receiver and timebases is on a separate, but attached, sub-chassis and is at a right angle to the receiver chassis. This change in angle provides good ventilation of the power supply in either method of mounting and keeps the size of the set uniform in both directions. An advantage gained by its attachment is the stability it gives to the assembly and the complete removal of switch vibration. The problem of H.T. rise when the video circuits are cut off is taken care of by separate H.T. lines for the sound and tuner section, video circuits and timebases. Some rise does occur but not outside the limits necessary, and the additional smoothing is such that even without a smoothing choke the set is free of hum and other untoward symptoms. Operation without choke is not, however, to be recommended.

Tuner

The tuner portion of the receiver is separately assembled on a 4½in. by 3½in. plate and this bolted into a cut-out in the main chassis. This is preferable to attempting to build it into the main chassis and having restricted access to switch contacts and components, and only involves half-a-dozen simple connections after bolting into position.

(To be continued)

COMPONENTS LISTS

LIST OF PARTS FOR FIG. 1 (p. 171)

C1—3-9 pF trimmer, T.C.C. type CC159N.
C2—3 pF.
C3, 4, 5, 6, 7, 10, 11, 13, 18, 19, 20—1,000 pF tubular ceramic.
C8, 9—10 pF, tubular ceramic.
C12—2 pF, tubular ceramic.
C14—10 pF, T.C.C. SCP8.
C15—.5 to 3 pF trimmer, Type CC164N.
C17—Fine trimmer.
C16—5 pF, SCP7 T.C.C.

R1—47 K.
R2, 3—100 K., ½ w.
R4—220 Ω.
R5—5.6 K.
R6, 12—1 K., ½ w.
R7, 14—10 K.
R8—100 K.
R9—680 Ω, ½ w.
R10, 13—15 K.
R11—6.8 K., 1 w., H.Stab.

LIST OF PARTS FOR FIG. 2 (p. 172)

C21, 22, 23, 25, 26, 27, 29, 30, 31, 32, 40—3,000 pF, ceramic tube.
C24—2 pF.
C28, 33—10 pF.
C34—16 μF.
C35—50 pF.
C36—.01 μF.
C37—5 μF 150 v.
C38 39—330 pF.
C41—50 μF 12 v.
C42—.1.

R15, 17, 29, 31—1 K. ½ w.
R16, 19, 20—180 Ω.
R18—100 K.
R21—10 K.
R22, 28—250 K.
R23, 27, 33—47 K.
R24—10 MΩ.
R30—250 K. pot.
R25, 26—18 K. 1%.
R32—100 Ω ½ w.
R44—33 Ω.
R45—4.7 K.
R46—3 K. variable.
R47—100 K. ½ w.

LIST OF PARTS FOR FIG. 3 (below)

C43, 45, 46, 49, 50, 51, 53, 56—3,000 pF ceramic tubular.
C44—.001 pF ceramic tubular.
C47, 48—22 pF ceramic tubular.
C52—10 pF ceramic tubular.
C54—16 μF (with C34 sound section).
C58—.1 μF 500 v. mica.

R34, 37—1 K. ½ w.
R35, 38—180 Ω.
R36—6.8 K.
R39—5.6 K.
R40—3 of 10 K. ½ w.
R41—33 Ω.
R42, 43—22 K. ½ w.

LIST OF PARTS FOR FIG. 4 (p. 172)

MT—6.3 v. 10 A. output and tube heater.
CH—50 Ω 3-5 H. 200-250 mA.
Cr—100 μF 350 v.
Cn—200 μF 350 v. } one can.
Ctb—50 μF 350 v.
Cv—50 μF 350 v. } one can.
Cs—50 μF 350 v.
Rs, Rv, Rtb—See text.

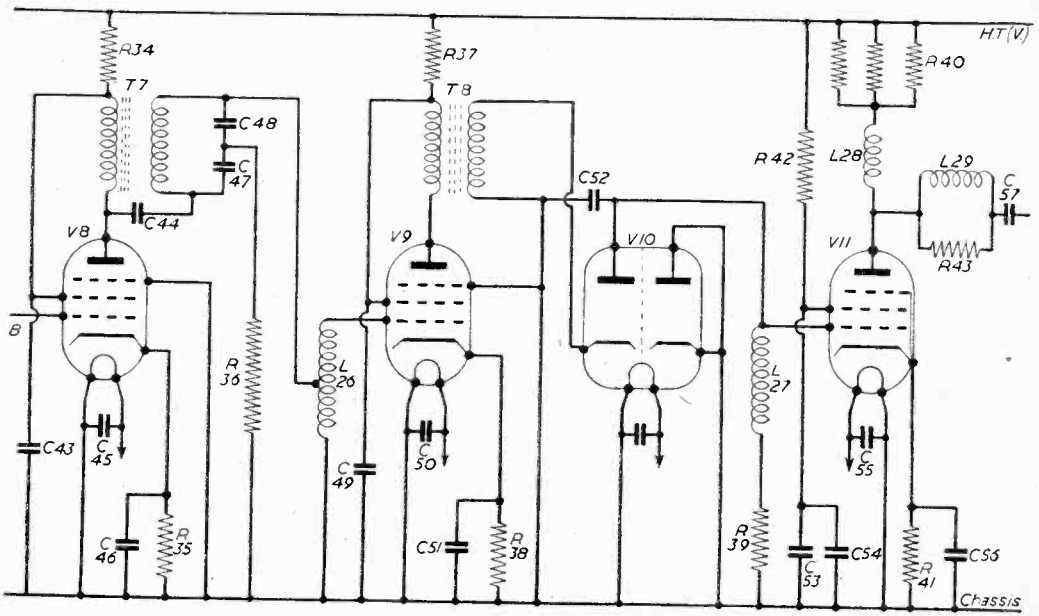


Fig. 3.—The vision I.F. section of the receiver.

Fault Tracing with the Neon Screwdriver

A USEFUL IDEA FOR AMATEURS WITHOUT TEST INSTRUMENTS

By W. G. Gough

MANY readers do not possess a good high-resistance voltmeter or a meter of any description, consequently they are very limited when it comes to fault tracing. However, many useful tests can be made on TV or radio receivers, and on electrical apparatus, with the inexpensive neon tester in the form of a screwdriver which can be purchased for a few shillings. Indeed, certain tests may be made in less time than it takes to get a meter out of its case and connect it up.

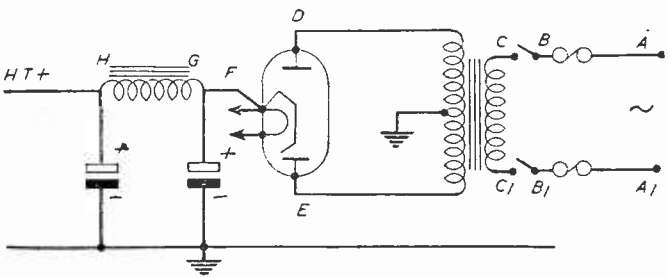


Fig. 1.—Points at which an A.C. power pack may be tested by means of the screwdriver.

Quite a large percentage of faults can be tracked down without precise measurements. The writer has made a number of tests with very useful results.

When using this tester, as with any instrument, it is helpful to know its limitations as well as its capabilities. The neon tube is in the insulated handle of the screwdriver, in series with the blade and a current-limiting resistor of the order of 500 KΩ. There is a metal contact at the end of the handle. The tip of the blade is applied to the test point of the apparatus and the circuit is completed through the body when we touch the contact at the end of the handle, providing that the neutral or negative pole of the circuit is connected to earth, as is the case with the mains supply or a receiver with an earth connection, or an A.C.-D.C. receiver with the neutral pole of the supply connected to chassis. Under these conditions it is a great advantage to be able to work with one hand only and also much safer. The neon tube operates in both directions and it will be observed that on A.C. a double glow appears with a gap in the middle, whereas on D.C. a single glow appears. The tester works on A.C. or D.C. providing the voltage at the test point is of the order of 125 volts or more, i.e., the "striking" voltage of the tube plus the voltage drop across the series resistor and the body.

One great advantage with this tester is its very low current consumption, with the result that there is no appreciable voltage drop at the test point. This is particularly useful when testing at the anode or screening grid of a valve where there is a very high series resistance. A table of approximate current values over a useful range of D.C. voltages obtained by the writer on a large capacity battery is given on page 176. It will be seen that the tester has a sensitivity better than 20 KΩ per volt over a useful range of voltages. A point to note is that the tube will continue to operate at a somewhat lower voltage than the striking voltage, once it has struck.

The tester should not be used on EHT voltages directly. As a safety precaution, when working on A.C./D.C. apparatus where the chassis is connected to the mains supply, it is advisable to see that the chassis is connected to the neutral pole of the mains before working on the apparatus. The neon will glow when applied to the chassis if the live pole is on the chassis. In this case the mains lead connections should be changed over. It is advisable to use a three-pin plug and socket so that the plug cannot be inserted the wrong way round.

When testing at the lower voltages, near the striking voltage, with one hand, the glow may be dim and if desired it can be increased by touching the chassis with the free hand. A number of articles have appeared in this journal dealing with fault tracing without instruments, and it will be seen that the scope can be widened by the use of this tester to indicate the presence of H.T. voltages.

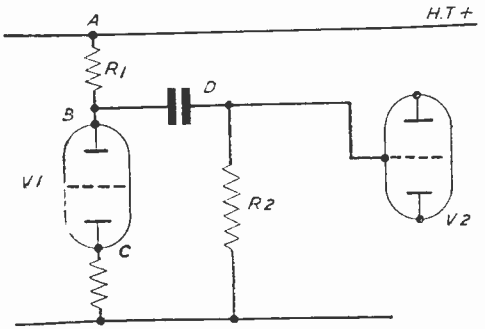


Fig. 2.—Testing at the valveholder in a receiver.

Uses

The following tests can be made on an A.C. receiver commencing with the power pack, having first checked the mains supply incoming. We can test with one hand at points A—H, Fig. 1. If no glow is obtained at A or A1 there is a break in the mains live lead or at the plug. If the leads are of different colours, as is usual, the live lead could be identified by opening up the plug, having first identified the live supply socket.

With the receiver switch on, check at A and A1. If a glow is obtained at both points we know that the neutral lead is broken, because with no current flowing there will be maximum voltage at both points.

Continuing our tests, check point B to test the fuse and C for the switch contact. If the primary of the transformer is suspected we could check for continuity at C1, having first removed the fuse at A1. The switch contacts at C1 can also be checked by testing at B1. The fuse at B1 could be checked by substitution with the one at B or by removing the mains lead connection at A1 and testing at that point. Passing to the H.T. secondary circuit a good glow should be obtained at D and E if all is well.

The rectified H.T. will, of course, be checked at F, G and H. No glow at F may be caused by valve failure, a broken valve holder or connection, a short circuit or leak to H.T. The latter may be traced by disconnecting the suspected components one by one and checking again, commencing with the electrolytic condensers at G and H. A fault of this nature may, of course, result in serious damage to the valve and/or mains transformer.

Heater Circuits

In an A.C./D.C. receiver the heaters of the valves are usually in series and can also be checked with the tester. If a glow is obtained at any of the heaters there is a break immediately beyond this point in the negative direction, if we have taken them in sequence from the positive end. The voltage dropper at the positive end could be checked by removing one of the valves when a glow will be obtained at both ends of the dropper.

Some useful tests can be made at the valve holders of a receiver. Fig. 2. A glow will be obtained at B providing the working voltage is not below the striking voltage of the tester. The application of the tester causes no appreciable voltage drop despite the fact that R1 may be of very high resistance. Should the working voltage at B fall below the striking voltage of the tester owing to high series resistance, we can check R1 for continuity by removing the valve, when full H.T. voltage will be obtained at B. On replacing the valve, the neon tube will become inoperative as the valve takes current, thus giving a useful check on the valve.

It is unusual for a cathode bias resistor to break between cathode and H.T. —. Apply the tester to C and, assuming the valve is able to pass current, a glow will be obtained if there is a break in the cathode circuit. With all these tests, of course, a brighter glow will be obtained if the chassis is touched with the free hand. A leaky condenser at D, Fig. 2, is difficult to trace without a good meter. If the grid to chassis resistance of V2 is high, we may be able to check directly at D, otherwise it would be necessary to disconnect at D and check again.

Volts	Direct Connection mA	Through Body mA
130	0.05	0.01
141	0.05	0.01
150	0.08	0.05
170	0.12	0.05
198	0.12	0.05
232	0.15	0.08
260	0.18	0.1
270	0.25	0.15
290	0.3	0.2

Table of current values obtained from tests on a dry battery over a useful range of voltages. The direct results were obtained by connecting a probe between the contact in the handle and chassis.

The Neon Tester should not be used directly to check EHT on a TV receiver. We can, however, check the output from the line output valve. The tester should be held vertically over the lead from the valve to the line output transformer, when a bright double glow will be obtained.

The writer has a TV receiver with an EHT voltage of 6.5 K. The line output valve is an EL38 with anode top cap. A good glow is obtained when the tester is held up to two inches above the valve.

The EHT output can, of course, be checked in the well-known manner by holding a large, well-insulated screwdriver close to the EHT terminal of the tube in the receiver, when a spark should jump across the gap.

While this article was in course of preparation the writer came home one evening to find that an element of an electric radiator had failed to heat up. The fault was traced in a couple of minutes with the tester. With the element switched on it was the work of a few moments to run along the element with the tester. It was seen that a full glow was obtained at each end of the element. The element was of the clip-in type, and at one end a glow was obtained at the end of the element but none on the clip. On switching off and removing the element the trouble was immediately apparent: the contact band of aluminium at the end of the element was burnt owing to an imperfect contact. On cleaning up this band the fault was cleared.

TOP QUALITY FULLY GUARANTEED VALVES BELOW MANUFACTURERS' PRICES

EXPRESS SERVICE!!!
C.O.D. ORDERS RECEIVED BY 3.30 P.M. EITHER BY LETTER, PHONE OR WIRE, DESPATCHED THE SAME AFTERNOON.

FOR ONLY 6d. EXTRA PER ORDER WE WILL INSURE YOUR VALVES AGAINST DAMAGE IN TRANSIT. ALL UNINSURED PARCELS AT CUSTOMER'S RISK.

OZ4	6/-	6AT6	8/6	6L7M	8/-	12AT6	10 6	35.51	12/6	CV428	30 -	ECC81	8/6	EZ80	8/6	PCF82	11/6	UBF80	9/6
IA3	3'-	6AU6	10/6	6L18	13/-	12AT7	8/6	35A5	11/-	DI	3 -	ECC82	7/6	EZ81	10/-	PCL82	12/6	UBF89	10/6
IA5	6'-	6B4G	6/-	6N7	8/-	12AU7	7 6	35L6GT	9/6	D42	10 6	ECC83	9/-	GZ30	10/-	PCL83	12/6	UCC85	10/6
IA7	15'-	6B7	10/6	6Q7G	8/6	12AX7	9'-	35W4	8/6	D63	5 -	ECC84	10/-	GZ32	12/6	PEN40DD		UCH42	10/-
ID6	10 6	6B8G	4/-	6Q7GT	9/-	12BA6	9/-	35Z3	10/6	D77	6 6	ECC85	9/6	GZ34	14/-		25/-	UCH81	11/6
IH5	11 -	6B8M	4/6	6R7G	8/6	12BE6	10'-	35Z4GT	8/-	DAC32	11 -	ECC91	5/6	H30	5'-	PEN45	19/6	UCL82	13/6
IL4	6 6	6BA6	7/6	6SA7GT	8/6	12E1	30'-	35Z5GT	9/-	DAF91	8 -	ECF80	12/6	H63	12/6	PEN46	6/6	UF41	9/-
ILD5	5'-	6BE6	7/6	6SG7GT	7'6	12H6M	3'-	41MTL	7/6	DAF96	9'6	ECF82	12/6	HABC80		PL82	9/-	UF80	10/6
ILN5	5'-	6BJ6	8/-	6SH7	6/-	12J5GT	4/6	50C5	12/6	DF33	11'-	ECH35	9/6		13/6	PL83	11/6	UF85	10/6
IN5	11'-	6BR7	11/6	6SJ7	8/-	12J7GT	10/6	50L6GT	8/6	DF91	7'-	ECH42	10/-	HK90	10/-	PM2B	12/6	UF89	10/6
IR5	8.6	6BW5	8/6	6SK7GT	6/-	12K7GT	8,6	61BT	12'6	DF96	9 6	ECH81	8/-	HL23	10/6	PM12	4/-	UL41	10/-
IS5	8 -	6BW7	9/-	6SL7GT	8/-	12K8GT	14/-	61SPT	15/-	DH63	8'6	ECL80	9/-	HL41	12/6	PM12M	6/6	UL46	15/-
IT4	7'-	6BX6	8/6	6SN7GT	7/6	12Q7GT	8'6	72	4/6	DH76	8 6	ECL82	13/6	HLI33DD		PY80	9/-	UL84	11/6
IU5	7'-	6C4	7/-	6SS7	7 6	12SA7	8'6	77	8/-	DH77	8'6	EF36	6/-		12/6	PY81	9/-	UY41	8/6
2A3	12 6	6C5	6/6	6U4GT	14/-	12SC7	7/6	78	8/6	DK32	15'-	EF37A	9/-	HVR2	20'-	PY82	7/6	UY85	10/6
2A7	10 6	6C6	6/6	6U5G	7/6	12SG7	7/6	80	8/6	DK91	8'6	EF39	6/-	HVR2A	6/-	PY83	9/6	V1507	5/-
2C26	4/-	6C8	8/-	6U7	8/6	12SH7	5.6	83	8/6	DK92	10'-	EF40	12/6	KL35	8'6	QP21	7/-	VLS492A	£3
2D13C	7 6	6C9	12/6	6V6G	7/-	12SJ7	8/-	85A2	15/-	DK96	9'6	EF41	9/6	KT2	5/-	QP25	15/-	VMP4G	15/-
2X2	4'6	6C10	12/6	6V6GT	7/-	12SK7	6/-	150B2	15/-	DL2	15 -	EF42	12/6	KT33C	10/-	QS150/15		VP2(7)	12/6
3A4	7'-	6CH6	7/6	6X4	7/-	12SQ7	8,6	807	6,6	DL33	9 6	EF50(A)	7/-	KT44	7/-		10/6	VP4(7)	15/-
3A5	12,6	6D6	6/6	6X5GT	6/6	12SR7	8/6	866A	12/6	DL92	8'-	EF50(E)	5/-	KT63	6/6	QVO4/7		VP13C	7/-
3B7	8 6	6E5	12/6	6Z4,84	12'6	12U5G	7/6	956	3/-	DL94	9 -	EF54	5/-	KTW61	6/6		15/-	VP32	6/6
3D6	5'-	6F1	15/-	6Z5	12,6	12Y4	10'6	1203	7/-	DL96	9'6	EF73	10/6	KTW62	8/-	R12	14/-	VP41	7/6
3Q4	9'-	6F6G	6/6	6/30L2	12 6	14R7	10'6	4033L	12/6	DLS10	10.6	EF80	8/6	KTW63	8/-	5D6	12/7	VR105/30	
3Q5GT	9 6	6F6GT	8/-	7A7	12,6	14S7	14'-	5763	12/6	DM70	8'6	EF85	7/6	KTZ41	6/-	SP4(7)	15/-		9/-
3S4	8'-	6F8	10'6	7B7	8'-	19AQ5	11/-	7193	5/-	EA50	2'-	EF86	12/6	KTZ63	10'6	SP41	3/6	VR150/30	
3V4	9'-	6F12	9'-	7C5	8'-	19H1	10,-	7475	7,6	EA76	9 6	EF89	10/-	L63	6/-	SP42	12/6		9/-
5U4	8'-	6F13	13/-	7C6	8/-	20D1	16'-	9002	5/6	EABC80	7/6	EF91	9/-	MH4	7/-	SP61	3/6	VT61A	5/-
5V4	12'6	6F16	9/6	7H7	8'-	20L1	13/6	9003	5/6	EAC91	7/6	EF92	6/6	MHL4	7/6	TP22	15/-	VT501	5/-
5X4	10'-	6F17	12/6	7Q7	9'-	25L6GT	9'-	9006	6/-	EAF42	10/6	EL32	5/6	MHLD6	12/6	U16	12/-	W76	8/6
5Y3	7'6	6F32	10/6	7V7	8'6	25Z4G	9/-	AC6PEN	6/6	EB34	2'-	EL41	10/6	ML4	12'6	U22	8/-	X61	12/6
5Y4	10'-	6F33	7/6	7Y4	8'-	25Z5	10'6	AC, HL/		EB41	8'6	EL42	11/-	ML6	6'6	U25	13/6	X65	12/6
5Z3	12,6	6G6	6,6	8D2	3'-	25Z6G	9'6	DDD	15/-	EB91	6/6	EL81	15/-	MU14	8/6	U31	9/-	X66	12/6
5Z4G	10'-	6H6M	3'6	8D3	9/-	28D7	7'-	AC, P4	8/-	EBC33	7/6	EL84	10/6	N78	12/6	U50	7/6	X79	12/6
6A8	10'-	6J5G	5/-	9D2	3,6	30	7'6	AP4	7/6	EBC41	10/-	EL91	5/-	OA10	12/6	U52	8/-	XD(1.5)	4/-
6B7	8'-	6J5GTG	5/6	10C1	15/-	30C1	12,6	ATP4	3/6	EBF80	9/6	EM34	10/-	OA70	5/-	U76	8/-	XFW10	6/6
6AB8	9'-	6J5GTM	6/-	10F1	15/-	30F5	12'6	AZ31	12,6	EBF89	9/6	EM80	10/6	OA71	5/-	U78	7/-	XFY12	6/6
6AC7	6 6	6J6	5/6	10F9	11 6	30FL1	12.6	B329	10/6	EC52	5/6	EY51		OC72	30/-	U251	15/-	XH(1.5)	4/-
6AG5	6.6	6J7G	6/-	10F18	12'6	30L1	12/6	BL63	7/6	EC54	6/-	(Small)	14/-	P61	3/6	U404	10/6	XSG(1.5)	4/-
6AG7	12.6	6J7GT	10/6	10LD3	8/6	30P4	15'-	CK505	6/6	EC70	12/6	EY51		PABC80		UABC80		Y63	7/6
6AJ8	8/-	6K7G	5/-	10P13	17'6	30P12	13/6	CK506	6/6	ECC31	15'-	(Large)	14/-		15/-		10/6	Z63	10/6
6AK5	5'-	6K7GT	6/-	11E3	15'-	30P16	10'6	CK523	6/6	ECC32	10'6	EY86	10/6	PCC84	8/-	UAF42	10/6	Z66	20/-
6AL5	6 6	6K8G	8/-	12A6	6/6	31	7/6	CV63	10/6	ECC33	8/6	EZ35	6/6	PCC85	12/6	UB41	12/7	Z77	9/-
6AM6	9'-	6K8GT	11/-	12AH7	8/-	33A/158M		CV85	12/6	ECC35	8/6	EZ40	8/-	PCF80	12/6	UBC41	8/6	Z719	12/6
6AQ5	7 6	6L6G	9/-	12AH8	10 6		30/-	CV271	10,6	ECC40	15/-	EZ41	10/6					Z729	12/6

TERMS OF BUSINESS :—CASH WITH ORDER OR C.O.D. ONLY. ORDERS VALUE £3 OR MORE SENT POST/PACKING FREE. ORDERS BELOW £3 PLEASE ADD 6d. PER VALVE. C.O.D. ORDERS :—MINIMUM FEE, INCLUDING POST AND PACKING, 3/-. WE ARE OPEN FOR PERSONAL SHOPPERS. MON.-FRI. 8.30-5.30. SATS. 8.30-1 p.m.

ALL VALVES NEW, BOXED, TAX PAID, AND SUBJECT TO MAKERS' GUARANTEE. FIRST GRADE GOODS ONLY, NO SECONDS OR REJECTS. ALL ORDERS RECEIVED BY FIRST POST DESPATCHED SAME DAY. S.A.E. FOR FREE COMPLETE LIST, WITH FULL TERMS OF BUSINESS.

We specialise in VALVES—of every kind and description—serving the industry for years. More than 2,000 different types in stock for IMMEDIATE DELIVERY—including hard-to-get and discontinued numbers. All valves exhaustively tested in our fully equipped laboratories, and re-tested at time of despatch. FULL NINETY DAY GUARANTEE. All valves individually boxed.

BENTLEY ACOUSTIC CORPORATION LTD.

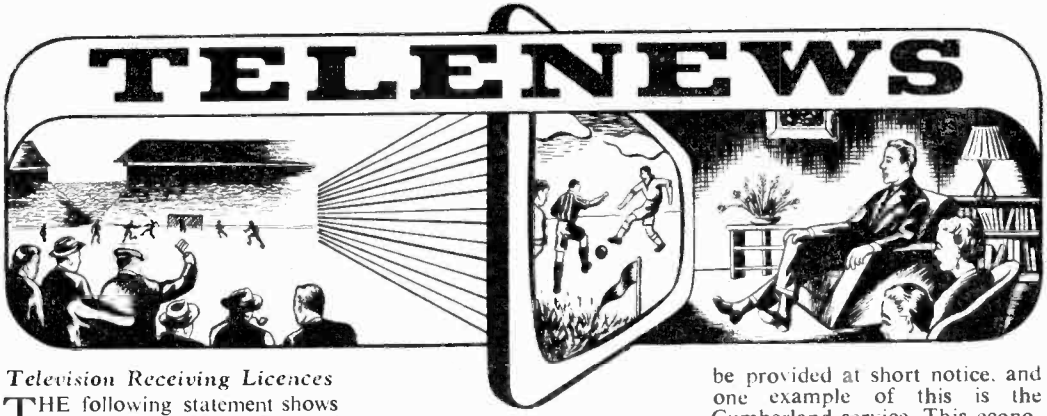
THE VALVE SPECIALISTS

38 CHALCOT ROAD, LONDON, N.W.1

PRImrose 9090

PLEASE ENQUIRE FOR ANY VALVE NOT LISTED. 3d. STAMP, PLEASE.

TELENEWS



Television Receiving Licences

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

Region	*Total*
London Postal...	1,514,878
Home Counties	876,307
Midland	1,204,967
North Eastern...	1,154,474
North Western...	1,040,966
South Western...	541,168
Wales and Border Counties ...	411,245
Total England and Wales ...	6,744,005
Scotland	517,276
Northern Ireland	69,926
Grand Total	7,331,207

"Telemovies"

"TELEMOVIES," a system of delivering films to home television sets over cables, had its first test recently in the Oklahoma oil town of Bartlesville, which has a population of about 25,000. Cables run from a central studio to each subscriber's house or flat.

Instead of a coin-in-the-slot meter system, the promoters are making a flat charge of £3 7s. 10d. a month payable in advance. They are providing 12 hours' continuous film showing daily on two channels.

One channel is for first-run films and the other for revivals of old pictures. For "opening night" the two were "The Pajama Game," now receiving its first showings in America, and "River Gamble," released three years ago.

It is proposed to show 26 features a month on the two channels. There is no advertising apart from announcements of future programmes.

No charge is made for connecting a home television set. About 300 subscribers have been connected so far and others are being brought in as fast as mechanics can do the work.

Microwave Radio Links Pontop Pike and Sandale Fell

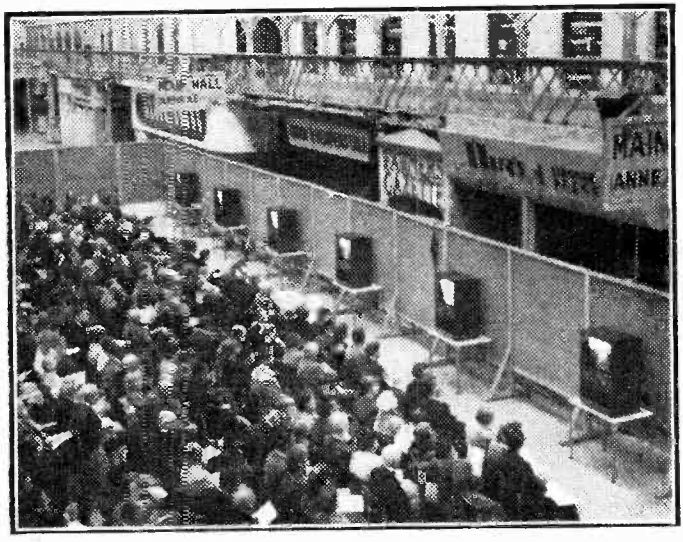
THE transportable type of outside-broadcast microwave equipment used by the G.P.O. as a link for the BBC Cumberland TV Service is expected to be replaced by a permanent station with new equipment in 1958.

Television programmes are distributed from the studios to the transmitting stations throughout the country over a network of cable and radio-relay links operated by the Post Office. Sometimes these links have to be provided at short notice, and one example of this is the Cumberland service. This economic method of relaying signals uses the radiated signal from a television transmitter in one area, receives it at the fringe of the service area, and retransmits it to feed a transmitter in another area.

The signal broadcast by Pontop Pike television transmitter is at present received twenty-eight miles away at a temporary station in the Pennines, near Haltwhistle. From there it is relayed thirty-four miles over a Post Office microwave link to the BBC station at Sandale Fell.

New I.T.A. Member

THE Postmaster General has appointed the Honourable Dame Frances Farrer, D.B.E., to



Overflow meetings are now able to follow a speaker by means of television. This picture shows the overflow meeting at Dublin on the occasion of the Congress of British Association for the Advancement of Science.

be a member of the Independent Television Authority.

The appointment dates from 4th September, 1957, and will continue until 3rd August, 1961.

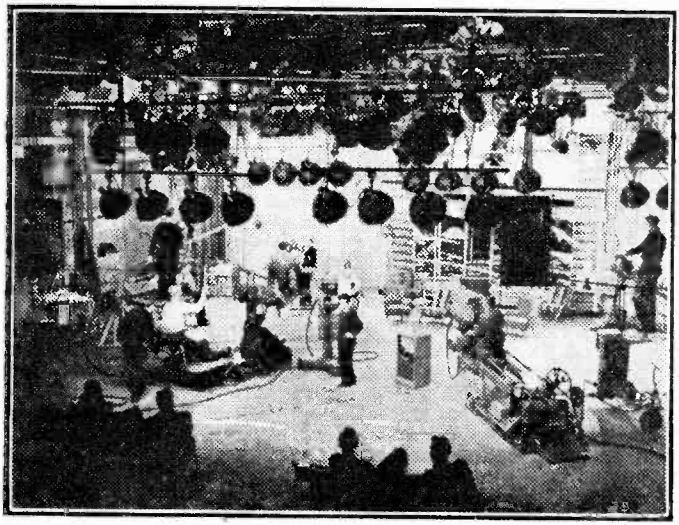
This appointment fills the vacancy caused by the expiry of the term of office of Miss Dilys Powell.

Norwich Television Station

THE BBC announces that the power of the television station at Norwich will be increased on 1st December, 1957, and will be further increased to full power in the spring or early summer of 1958. The permanent aerial, mounted on a 500ft. mast, was brought into service on 8th October, 1956, to replace the earlier temporary aerial, and the permanent transmitters had been installed by that time. The station has, however, continued to operate on reduced power in order to avoid interference with the Belgian station at Liege which, under international agreements, has a right to protection against such interference. Agreement has been reached between the British Post Office and the Belgian authorities by which the power used at Norwich can be partially increased in December and further increased next spring, by which time a transmitter of higher power is expected to be available in Belgium.

The effect of these changes will be that from 1st December the signal strength available to viewers in East Anglia will be nearly doubled and in the spring it will be again doubled. Viewers, especially in the fringe areas, will benefit from both these increases. In the final condition the service area is expected to extend so as to embrace Saxmundham to the south, Ely to the west, and Hunstanton to the north. There will be no change in the wavelengths used, so that viewers need not make any change in their aerials or in the tuning of their receivers when the power is increased. It is possible, however, that some viewers in the fringe areas tuned to the Crystal Palace on channel 1 or Holme Moss on channel 2 may find it worth while to tune to Norwich on channel 3 and to re-direct their aerials accordingly.

The Norwich station is provided with a directional aerial and the effective radiated power in the final condition will vary between 1 and 10 kW in different directions.



This picture gives a good idea of the volume of lighting used in a television studio.

A TV Train

BLACKPOOL illuminations were the destination of four special Saturday excursions by the TV Show Train from Glasgow and Motherwell.

A team of first class artistes provided entertainment from a specially equipped sound-proof studio fitted up in one of the brake vans, and the latest innovation, the screening of short 16mm. films, took place. The showing of films on closed circuit television on a railway train has not previously been achieved elsewhere in the world, adding yet another record to the Scottish Region's Television Excursion Train. This is made possible by the operator projecting the film on to a screen, where the image is picked up by the television cameras and relayed throughout the train. In addition, music is relayed by means of a tape recorder.

Television screens are positioned above the doors of the open coaches and are visible to all passengers. Each coach is also fitted with separate loudspeakers for recorded music and points are provided for use with a roving microphone.

The artistes were not only televised on the closed circuit but also visited each coach.

C.R.T. ISOLATION TRANSFORMER

Type A. Low leakage windings. Ratio 1 : 1.25 giving a 20% boost on secondary. 2 v., 10/6; 4 v., 10/6; 6.3 v., 10/6; 10.8 v., 10/6; 13.3 v., 10/6.
Ditto with mains primaries, 12/6 each.
Type B. Mains input 200/240 volts. Multi Output 2, 4, 6.3, 10 and 13 volts. Input has two taps which increase output volts by 25% and 50% respectively. Low capacity, suitable for most Cathode Ray Tubes, 21/-.
Ditto with mains primaries, 12/6 each.
Type C. Low capacity wound transformer for use with 2 volt Tubes with falling emission. Input 200/240 volts. Output 2-2½-2½-2½ volts at 2 amps. With Tag Panel, 17/6 each.
NOTE.—It is essential to use mains primary types with T.V. receivers having series-connected heaters.

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

12/6 PURETONE RECORDING TAPE

1,200 ft. on standard 7" Plastic reels. Spools 5" metal, 1/6, 7" metal, 2/3.

FERROVOICE 1,200 ft. Plastic Tape 25/-

O/P TRANSFORMERS. Heavy Duty 50 mA., 4/6. Multiratio, push-pull, 7/6. Miniature, 3S4, etc., 4/6.
L.F. CHOKES 15-10 H. 60/65 mA., 5/-; 10 H. 80 mA., 8/6; 10 H. 150 mA., 12/6.
MAINS TRANS. 350-0-350, 80 mA., 6.3 v. tapped 4 v., 4 a., 4 v. tapped 4 v. 2 a., ditto 250-0-250, 22/6. Bargain 300-0-300 65 mA., 6 v. 4 a., 4 v. 2 a., 15/-.
HEATER TRANS. Tapped prim., 200/250 v. 6.3 v. 1½ amp., 7/6; tapped sec. 2, 4, 6.3 v., 1½ amp., 8/6; prim. 230 v. Sec. 6.3 v. 3 amp., 10/6.
ALADDIN FORMERS and core, ½in., 8d.; ¾in., 10d. 0.3in. **FORMERS** 5937/8 and **Cans TVI/2.** ½in. sq. x ¾in. and ¾in. sq. x 1½in., 2/- ea., with cores.
TYANA.—Midget Soldering Iron 200/220 v. or 230/250 v., 16/9. Solon Instrument Iron, 24/-.
MAINS DROPPERS. 3 in. x 1½in. Adj. Sliders, .3 amp. 750 ohms, 4/3. 2 amp., 1,000 ohms, 4/3.
LINE CORD. .3 amp., 60 ohms per fout, .2 amp., 100 ohms per fout, 2-way, 6d. per fout. 3-way, 7d. per fout.
LOUDSPEAKER, P.M. 3 OHM. 2½in. square, 12/6. 5in. Goodmans, 17/6. 7in. x 4in. Goodmans, 21/-. 3½in. square, Elac, 21/-. 8in. Plessey, 19/6. 9½in. Goodmans, 18/6. 10in. R. & A., 30/-.
TSL Tweeter, LSH75, 8/6. 12in. Plessey, 30/-. 8in. M.E. 2.5k field, tapped O.P. transf., 24/6. 15 ohm Plessey 10 wt. 12in. with Tweeter, 97/6.
CRYSTAL DIODE G.E.C., 2/-. **GEX34,** 4/-.
HIGH RESISTANCE PHONES. 4,000 ohms, 16/6 pr.
MIKE TRANSF, Ratio 50 : 1, 3/9 ea.; 100 : 1, 10/6.
SWITCH CLEANER Fluid, squirt spout, 4/3 tin.
TWIN GANG TUNING CONDENSERS, 365 pf. miniature 1in. x 1¼in. x 1¼in., 10/-. .0005 Standard with trimmers, 9/-; less trimmers, 8/-; midget, 7/6; single, 50 pF, 2/6; 100 pF, 7/-; 150 pF, 8/6.
SPEAKER FRET, Expanded Metal Silver, 15¾in. x 9¼in., 2/- each; 14¼in. x 12in., 3/- ea.
GOLD CLOTH. 18in. x 25in., 5/-; 25in. x 36in., 10/-.
Tygan 4ft. 6in. wide, 10/- ft.; 2ft. 3in. wide, 5/- ft.
MORSE KEYS, good quality, 2/6 ea.

All Boxed VALVES New & Guaranteed

1R5	8/6	6K8	8/6	EB91	6/6 EU148 1/6
1S5	8/6	6L6	10/6	EBC33	8/6 HABC80
1T4	8/6	6Q7	10/6	EBC41	10/6 12/6
2X2	3/6	6SA7	7/8	EBF80	8/6 HVR2A 7/6
3S4	8/6	6SN7	8/6	ECC84	12/6 MU14 10/6
5Y4	8/6	6V6G	7/6	ECF80	10/6 PCC84 12/6
5U4	8/6	6V6GT	8/6	ECF82	10/6 PCF80 10/6
5Y3	8/6	6X4	7/6	ECH42	10/6 PCF82 10/6
5Z4	10/6	6X5	7/6	EC L80	8/6 PCL82 10/6
6AM6	8/6	12AH8	10/6	EF39	7/6 PL82 10/6
6BE6	7/6	12AT7	10/6	EF41	10/6 PY80 10/6
6BH6	10/6	12AU7	10/6	EF50	5/6 PY81 10/6
6BW6	8/6	12AX7	10/6	Equip.	PY82 10/6
6BW7	8/6	12BE6	10/6	EF80	5/6 SP61 5/6
6CH6	10/6	12BH7	10/6	Sylv.	8/6 UBC41 8/6
6D6	7/6	12A H	8/6	EF80	10/6 UCH42 8/6
6F6	7/6	12Q7	8/6	EF92	5/6 UF41 8/6
6H6	3/6	35Z4	10/6	EL32	5/6 UL41 8/6
6J5	6/6	80	8/6	EL84	10/6 UY41 8/6
6J6	7/6	954	1/6	EY51	11/6 U22 10/6
6J7	8/6	1A50	1/6	EZ40	10/6 U25 11/6
6K6	6/6	EABC80	8/6	EZ81	11/6 X79 10/6
6K7	5/6				

1957 RADIOGRAM CHASSIS

THREE WAVEBANDS. FIVE VALVES S.W. 16 m.—50 m. LATEST MULLARD M.W. 200 m.—550 m. ECH42, EF41, EBC41. L.W. 800 m.—2,000 m. EL41, EZ40.
12 month guarantee.
A.C. 200/250 v. 4-way Switch; Short-Medium-Long-Gram. A.V.C. and Negative feedback 4.2 watts. Chassis 13½ x 5½ x 2½in. Glass Dial 10 x 4½in., horizontal or vertical available. 2 Pilot Lamps, Four Knobs, Walnut or Ivory. Aligned and calibrated. Chassis isolated from mains.

10 gns. Carr. & Ins., 4/6.

TERMS: Deposit £5.5.0 and six monthly payments of £1.
MATCHED SPEAKERS FOR ABOVE CHASSIS 8in., 17/6; 10in., 25/-; 12in., 30/-.

RECOMMENDED FOR ABOVE CHASSIS
★ **COLLARO** ★
HIGH-FIDELITY AUTOCHANGER 1957 Model RC456
7in., 10in., 12in. Records
16, 33, 45, 78 r.p.m.
4 SPEEDS—10 RECORDS
With Studio "O" pick-up
BRAND NEW IN MAKER'S BOXES

OUR PRICE £9.15.0 post free

TERMS: Deposit £5.5.0 and six monthly payments of £1. Space required 14in. x 12½in. 5in. above and 3in. below. Cut Out board, 6/-.

GARRARD 4-SPEED RECORD CHANGERS RC120/4H 1957 MODELS
Brand new and fully guaranteed 12 months.

AUDIO PERFECTION

Designed to play 16, 33, 45, 78 r.p.m. Records, 7in., 10in., 12in. Lightweight Xtal. pick-up, turnover head, two separate sapphire styli, for Standard and L.P., each plays 2,000 records. Voltage 200/250 A.C.

OUR PRICE £10.15.0 each, Post Free.

Terms: Deposit £6 and 6 monthly payments of £1. Space required 14in. x 12½in. 5in. above and 3in. below. Cut Out board, 6/-.

AMPLIFIER—RECORD PLAYER CABINETS. Cabinet size 18¾in. x 13½ x Ht. 8¾in., with motor board 14 x 12½in., £3.3.0. post 3/-.

ALUMINIUM CHASSIS. 18 s.w.g. undrilled. With 4 sides, riveted corners and lattice fixing holes, 2½in. sides, 7 x 4in., 4/6; 9 x 6in., 5/9; 11 x 7in., 6/9; 13 x 9in., 8/6; 14 x 11in., 10/6; 15 x 14in., 12/6; 18 x 16 x 3in., 16/6.

TRANSISTORS. Audio, 10/-: R.F. 2.6 Mc/s. 21/-. Mullard OC71, 20/-.

SUPERHET COIL PACK. 27/6. Miniature size 2½in. x 2½in. x 1¼in. HIGH "Q" Dust cored Coils. Short, Medium, Long, Gram Switching. Single hole fixing with connection diagram and circuit. 465 Kc/s I.F.

COLLARO 4-speed Motor and Turntable with selecting switch for 16, 33, 45, 78 r.p.m. records. 200-250 v. A.C. 50 cps. Also **HIGH FIDELITY** Lightweight Pick-up Acos Xtal turnover head, separate Sapphire styli for L.P. and Standard records. **SPECIAL OFFER, THE TWO! £4.12.6,** post 2/6. 14 x 12½in. Cut Out Board, 6/-.
SUITABLE AMPLIFIER-PLAYER CABINET. Ready cut out for above. 45/-.

CRYSTAL MIKE INSERT by Acos, precision engineered. Size only 1¼ x 3/16in. Bargain Price 6/6. No transformer required.

CHAMPION VHF (FM) TUNER, 88-96 mc/s.

5 Mullard valves and superhet tuning heart. Maroon and cream receiver styled cabinet 12 x 6 x 6in. Features: This is a self-powered 200/250 v. A.C. VHF (FM) Adaptor with operating and servicing data and a screened lead for connection to pick-up sockets of any radio, radio-gram. or amplifier.
Brand new with 12 months' guarantee. List price, 16 gns. Our price, **10 gns.,** carr 4/6.

Volume Controls

Long spindles. Guaranteed 1 year. Midget 1 watt. No Sw. S.P.Sw. D.P.Sw. 3/- 4/- 4/9
Lin or Log Tracks.

80 ohm CABLE COAX

Semi-air spaced Polythene insulated. ½in. dia. Stranded core. Losses cut 50% **9d.** yd.
STANDARD **8d.** yd.
½in. Coax.

COAX PLUGS ... 1/- **DOUBLE SOCKET** ... 1/3
SOCKETS ... 1/- **OUTLET BOXES** ... 4/6
BALANCED TWIN FEEDER, yd. 6d. 80 or 300 ohms.
DITTO SCREENED per yd. 1/-. 80 ohms only.
WIRE-WOUND POTS. 3 WATT. Pre-Set Min. T.V. Type. All values 25 ohms to 30 K., 3/- ea. 50 K., 4/-. (Carbon 50 K. to 2 m., 3/-.)
WIRE-WOUND 4 WATT. Pots 2½in. Spindle. Values, 100 ohms to 50 K., 5/6; 100 K., 6/6.
CONDENSERS. New stock. .001 mfd. 7 kV. T.C.C., 5/6; Ditto, 20 kV., 9/6; 100 pf. to 500 pf. **Micas 6d.**; Tubular 500 v. .001 to .01 mfd., 9d.; .05, .1, 1/-; .25, 1/6; .5/350 v., 1/9; .1/350 v., 9d.; .1/600 v., 1/3; .1 mfd., 2,000 volts, 3/6.
CERAMIC CONDS., 500 v., .3 pf. to .01 mfd., **10d.**
SILVER MICA CONDENSERS. 10% 5 pf. to 500 pf., 1/-; 600 pf. to 3,000 pf., 1/3. **DITTO** 1% 1.5 pf. to 500 pf., 1/9; 515 pf. to 5,000 pf., 2/-.

I.F. TRANSFORMERS 7/6 pair

465 Kc/s Slug tuning Miniature Can. 2½in. x 1in. x 1in. High Q and good bandwidth. By Pye Radio. Data sheet supplied.

Wearite M800 IF 465 Kc/s, 12/6 per pair.

NEW ELECTROLYTICS. FAMOUS MAKES

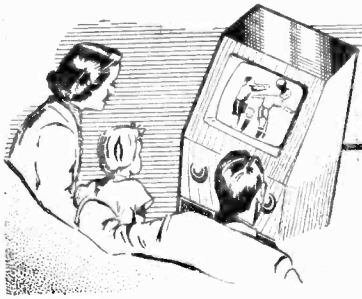
TUBULAR	TUBULAR	CAN TYPES
1/350 v. 2/-	100/25 v. 2/-	8+16/500 v. 5/6
2/450 v. 2/3	8+8/500 v. 4/6	16+16/500 v. 6/-
4/450 v. 2/-	16+16/500 v. 5/-	25+20/450 v. 5/6
8/450 v. 2/3	8/-	32+32/350 v. 6/6
8/500 v. 2/9	**CAN TYPES**	32+32/450 v. 6/6
16/350 v. 3/6	Clips. 3d.	50+50/350 v. 7/-
16/500 v. 4/-	16/450 v. 3/6	60+100/350 v. 11/6
32/450 v. 5/6	32/350 v. 4/-	100+200/275 v. 12/6
25/25 v. 1/9	64/350 v. 5/6	
50/25 v. 1/9	500/12 v. 3/-	1,000+1,000/6 v. 6/3
50/50 v. 2/-	8+16/450 v. 5/-	

Screw Base Type 512, 8/500 v., 3/-; 16/500 v., 4/-

SENTERCEL RECTIFIERS. E.H.T. TYPE FLY-BACK VOLTAGES. K3/25 2 kV., 5/-; K3/40 3.2 kV., 7/-; K3/45, 3.6 kV., 7/6; K3/50 4 kV., 8/-; K3/100 8 kV., 14/6. **MAINS TYPE CONTACT COOLED** 250 v. 50 mA., 8/6; 250 v., 85 mA., 9/6.
COILS Wearite, "P" type, 3/- each. Osmor Midget "Q" type adj. dust core, from 4/-. All ranges.
TELETRON. L. & Med. T.R.F., with reaction, 3.6.
FERRITE ROD AERIALS, M.W., 8/9; M. & L., 12.8.
T.R.F. COILS A/HF, 7/- pair. **H.F. CHOKES,** 2.6.
FERRITE ROD 8in. x 5/8in. dia. 2/6.

JASON F.M. TUNER COIL SET. 28/-. H.F. coil, aerial coil, Oscillator coil, two I.F. transformers 10.7 Mc/s. Detector transformer and heater choke. Circuit book using four 6AM6, 2/-. J.B. Chassis and Dial, 19/6.
Complete Jason F.M. Kit, £5.18.6.
With Jason superior calibrated dial, **£6.15.0.**

FULL WAVE BRIDGE SELENIUM RECTIFIERS 2, 6 or 12 v. 1½ amp., 8/9; 2 a., 11/3; 4 a., 17/6.
CHARGER TRANSFORMERS. Tapped input 200/250 v. for charging at 2, 6 or 12 v., 1½ amp., 15/6; 2 amp., 17/8; 4 amp., 22/6.
VALVE and **T.V. TUBE** equivalent books, 5/-.
TOGGLE SWITCHES. S.P. 2/-. D.P. 3/6. D.P.D.T. 4/-.
WAVECHANGE SWITCHES.
5 p. 4-way 2 wafer, long spindle 6/3
2 p. 2-way, 3 p. 2-way, short spindle 2/6
2 p. 6-way, 4 p. 2-way, 4 p. 3-way, long spindle 3/6
3 p. 4-way, 1 p. 12-way, long spindle 3/6
VALVEHOLDERS. Pax. Int. Oct., 4d. **EF50, EA50,** 6d. B12A, CRT, 1.3. Eng. and Amer. 4, 5, 6, 7, and 9 pin, 1/-. **MOULDED** Mazda and Int. Oct., 6d. B7G, B8A, B8G, B9A, 9d., B7G with can, 1.3. VCR97, 2/6, E98 with can, 2/6. CERAMIC EF50, B7G, B9A, Int. Oct., 1/-. B7G with can, 1.3
BLACK CRACKLE PAINT, air drying, 3/- tin.



UNDERNEATH THE DIPOLE

TELEVISION PICK-UPS AND REFLECTIONS

By Iconos

A SPARKLING TRIFLE

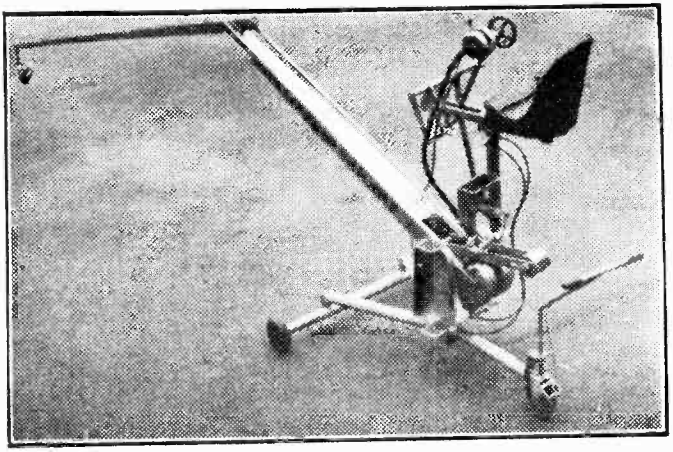
TWO wooden battens hinged to a handle make a terrific clacking noise when slapped together. This simple device was invented many years ago for the Harlequinade, in which Joey the clown slapped the hind-quarters of Pantaloon Policeman or other characters in the old legendary finale of the Drury Lane pantomimes. Hence the term "slapstick."

Knockabout and slapstick are generally considered to be at the low end of the comedy spectrum. At their best, they raise hearty laughter, guffaws and—in the words of the clowns themselves —"belly laughs." Good clowning and visual comedy require the most expert handling, especially as regards timing and emphasis. At the other extreme of the comic spectrum is "polite" comedy—comedy of manners, with witty dialogue and subtle under-playing. Rarely does this produce full-throated laughter, but it achieves its object if it causes a continuous succession of smiles and chuckles.

Both main classes of comedy come over well on television, and BBC's *The Girl at the Next Table* was a good example of TV high comedy at its best. Written by Philip Mackie, the story-line was as light as a feather, with dialogue to match. But it was a perfect vehicle for the effervescent Ian Carmichael, who played the part of a "professional bachelor" to perfection. No sooner was he captivated by one pretty face than he looked around and spotted an even prettier one at another table. The parade of pretty faces included Janette Scott, Rosalind Hadden, Virginia Maskell, Jennifer Wilson and Shirley Lawrence. They looked their best, thanks to the expert camera work and lighting by the technicians, and to the delicate direction of Stuart Burge. The camera was constantly on the move and yet the mechanics of such movements were not obtrusive. Every move was motivated by, and subsidiary to, the action and dialogue. This is achieved by allowing movement on the part of the actors to precede camera movement—never to anticipate the actors' moves by starting the camera tracking or panning first. More and more am I impressed with the sheer professional gloss that the BBC TV producers are able to give their productions, as compared with I.T.A. *The Girl at the Next Table* was a sparkling trifle, perfectly presented, which deserved just a little more plot to sustain it.

A.B.C.—TV PROGRESS

THE I.T.A. Companies, with few exceptions, prefer meaty, full-blooded dramas in their full-length plays, in series or in serials. A.B.C.-TV's *The Schirmer Inheritance* is anything but light, with a plot so thick that even the actors fail to find their way through it, in spite of the excellent settings and much improved production work. The same company's *Armchair Theatre* series, which started off so badly, now seems to have settled down into a worth-while programme, but their *Hours of Mystery* still makes one think about switching over to the other TV programme. The filmed introduction to each episode of this series is a poor technical job which encourages the viewer to reach for the switch even before the play starts. The same applies, I think, to the introductions which precede the Douglas Fairbanks TV-film plays. There is no necessity for anyone to talk about the play before it starts or after it has finished, and even the charm of Douglas Fairbanks cannot sustain this old fashioned custom. It is rather like dotting the i's with a crowbar. The only excuse for it is to fill up time.



A new type of microphone boom, especially developed for television studio use by Scanners Ltd.

And such a reason is quite inexcusable.

I.T.-NEWS

WHEN the I.T.-News started, it had a full-length title on the front of each issue, backed with specially composed signature tune music. In the course of time, the title has been shortened in duration to a few seconds, but the music survives, clipped fore and aft, like hearing the second and third bars only of "Rule Britannia!" The I.T.N. title music is familiar and pleasant, and it would be a pity to lose it. Perhaps it could be tidied up and the best part only used, with a clean finish instead of a fade-out. Alternatively, the whole tune could be used, the last part faded very low behind the whole of the "headline" announcements. Otherwise, apart from its outside interviews, the I.T.-News maintains its lead ahead of the BBC News. But the BBC is fast catching up. Presentation is slick, film picture quality is often better than I.T.N., and even the announcers permit themselves a faint glimmer of a smile. They have learned that a grim, set expression produces an even more grim and horrifying reaction from the viewers!

ITALIAN LOVE STORY

THE face of William Franklyn is becoming very familiar to viewers. He had a major part in *The Girl at the Next Table*, previously mentioned, in which he was a most admirable foil to Ian Carmichael in that lightest of comedies. In *Italian Love Story* he had quite a different kind of part to tackle, and he accomplished the stiff task with ease. This was a most dramatic —but somewhat overlong—play about the problems confronting a British Army Captain at the time of the Allied advance in Italy in 1943. Capt. Brecken, played by William Franklyn, was in charge of a community of several thousand people who were leaderless, exploited by blackmarketeers and partisans, and almost starving. He is ordered to withdraw to the main British position, thus leaving the little townships at the mercy of the Germans and the fanatical Fascists. Brecken's problem is whether to abandon the people he has come to respect and who respect him—or to remain and protect them. Naturally, there is a girl in the story. She is Maria, the daughter, played by Gene Anderson.

STUDIOS GALORE

SOME months ago I reported upon the large number of BBC studios there were in the London area. The grand total for television and sound studios, excluding rehearsal halls, exceeded a hundred. Contrasted with this enormous figure was the restricted facilities used by A-TV and AR-TV, with the latter organisation at that time actually reducing their studio space and concentrating as much work as possible at their Wembley studios. The tide has now turned, advertising space is being fully booked up and all of the established TV contractors are showing a good profit on their second year's operations, after an almost disastrous first few months. Plans for new studios and the acquisition of new equipment are now advanced by most of the companies. AR-TV is putting in new Cintel flying-spot film scanners. ABC-TV is venturing into tele-recording. Granada have vast new building extensions in view.

FROM STRAIGHT TO SUPERHET

(*Continued from page* 122, *October issue*)

Generally some form of automatic compensator is provided in the shape of a thermistor or brimistor and it will take care of the extra load in the chain. The voltage tap on the mains-dropping resistor can also be altered so that it is at the next *lowest* voltage.

So far as H.T. supplies are concerned the supply of the existing televisor should be sufficient to carry the small extra load. However, if the televisor is at the moment being worked to the limit then a separate power supply could be arranged and fed from the same switch that controls the televisor so that both supplies are switched off together.

Some Further Hints

Not all home-constructed televisors follow the pattern shown in Fig. 1. Some use the scheme shown in Fig. 3 where the single aerial is commoned to the inputs of the sound and receiver section.

The simplest method of dealing with this kind of situation is to insert the tuner at the point shown in the diagram, i.e., between the aerial feed and the point where sound and vision stages are coupled together.

Another point is that, allowing for the increased efficiency of modern valves, the tuner may cause the succeeding circuits to be overloaded. The cure is quite simple. One or more of the vision and/or sound I.F. stages can be omitted, the valves complete with their associated circuits being entirely removed.

A further point is that if a receiver is working on the borderline of stability, the addition of the tuner may cause the whole circuit to become unstable and for self-oscillation to take place. The cure here is to overhaul completely the decoupling systems, both at the heaters and at the common H.T. supplies.

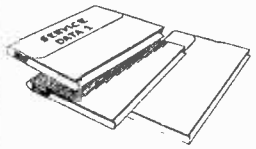
If instability is experienced when the tuner is connected to the common H.T. supply, then a simple filter can be inserted as shown in Fig. 4. This will effectively decouple the H.T. feed to the tuner from the main H.T. supply.

One point of warning. Where the televisor is working on the A.C./D.C. principle it is possible for the chassis to become "live." Under these circumstances great care must be taken to avoid accidental contact. In cases where it is known that the chassis is live with respect to earth, the mains plug can be reversed.

This danger is not so apparent with home-constructed receivers except those of later dates, as isolated mains supplies via transformers was the general rule.

In conclusion it must be stated that it is not possible for us to give full conversion details for particular televisors. If the instructions we have given are followed carefully, then success should be assured.

T.V. SERVICE SHEETS



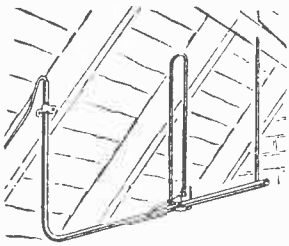
100 sheets covering the most popular post-war Televisors by leading makers—Cossor, Ekco, Ferguson, Pye, etc., etc. Special 25% reduction to P.T. readers who order this month will receive the complete 100 sheets as printed. **15**/- post free.

TAPE DECK

Made by the famous Truvox Company. This contains exactly the same essentials as the current model. Only the styling is different. It also takes the stereophonic head.

Specification : 3 B.T.H. shaded pole motors with silent friction drive eliminating wow and flutter. Push-button controls, electrically and mechanically interlocked. Patented electric type push-button controlled brake. Tape loading on the drop-in principle, accommodation for reels of 7in. diameter. Tracking sense to British and American standards. Playing times : up to 3 hours with L.P. Tape or 2 hours with L.P. Tape or 2 hours with Standard Tapes. Two tracks side by side with safety gap. Positive Azimuth adjustment of Record Player head. High Impedance Heads. Overall size 14½in. x 12½in. x 5in. approx. 120 only of these fine decks offered at non-repeatable price of **£17/10/-** or **£3/10/-** down and eight monthly payments of **£3**. Non-callers add **10**.- carriage and insurance.

BAND III AERIALS



This is a ½ wavelength, 3 element array. Of all alloy construction the aerial is completely assembled and ready for instant mounting in loft, bedroom cupboard, window frame, etc. Price **12/6** plus 2/- post and insurance.

BAND III CONVERTER

Suitable London, Midlands, North, Scotland, etc. All the parts including 2 valves, coils, fine tuner, contrast control, condensers and resistors. (Metal case available as an extra.) **19.6**, plus 2/6 post and insurance. Data free with parts or available separately **1/6**.

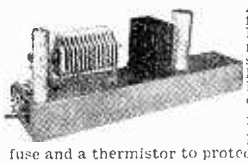
T.V. UNITS

THE I.F. UNIT

Employs 8 miniature valves, sound and vision are 34·36 and 37.5 mc.s respectively. Output just over one watt sound. Employs variable peak white clipper to reduce vision interference and sound interference. The unit which can be driven by any standard 34·37 mc.s turret or other tuner, is beautifully made and contained on a chassis size approx. 8in. x 4½in. x 2in.

The unit with valves made up, aligned and ready to work, is available price **£9 12 6**.

THE POWER UNIT

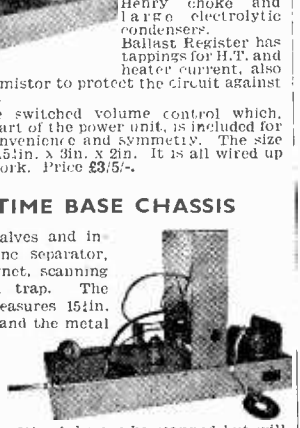


A.C. D.C. working for .3 amp. valves. Rectification is by metal rectifier; smoothing is by a 3 Henry choke and large electrolytic condensers.

Ballast Register has tappings for H.T. and heater current, also fuse and a thermistor to protect the circuit against current surges.

A double pole switched volume control which, although not part of the power unit, is included for the sake of convenience and symmetry. The size of the unit is 15½in. x 3in. x 2in. It is all wired up and ready to work. Price **£3/5/-**.

THE TIME BASE CHASSIS



This uses 6 valves and includes the sync separator, the focus magnet, scanning coils and ion trap. The whole unit measures 15½in. x 6½in. x 2in., and the metal work includes tube support for chassis mounting a 14in. tube, but up to 21in. tube can be scanned but will require separate mounting. Price for the unit with valves ready made up and tested is **£12 15/-**.

NOTE

These three units, although quite separate and usable separately may also be joined together and then comprise a complete T.V. less only tuner unit and speaker (available if required). Demonstrations at all branches.

TURRET TUNER

Brand new stock, not surplus, with coils for Band I and III, complete with valves PCC84 and PCF80—I.F. Output 33/38 mc.s with instructions and circuit diagram **79/6** With knobs **3/6** extra, post and ins. 2.6.

BARGAINS TO CLEAR

A.C. Superhet 5-Valve Chassis. Medium and two short, unused, but less valves and mains transformer. Uses standard Octal range. **27/6**. (Again,coil pack worth much more.) Non-callers add 6 6.

A.C. Superhet 7 v. 5-Waveband Chassis. H.F. stage. Unused. Less valves and power pack. Slightly soiled. Coil pack worth twice as much. circuit diagram supplied. **£2/15 0.** carriage and insurance 7/6.

A.C. 4-Valve Superhet, complete with valves, but less scale and pointer, unused. Circuit diagram supplied. **39/6** plus.

Note that the above three chassis, although unused, will need checking. On account of low price no guarantee is given. Nor, we regret, can technical assistance be given.

.1 mfd. 350 v. Small Tubular Metal cased Condensers. Made by Dubilier. **2.6** per dozen.

Germanium Diodes. B.T.H., with wire ends. **10d.** each or **9/-** dozen.

Midget I.F. Coils. Dust cored, size 1¾ x 1in., 465 Kc s. **4 6** pair.

Standard Size I.F. Coil. Dust cored, 465 mc s. **4 6** pair.

Coil Pack for Superhet. 465 Kc's I.F. Medium and 2 short waves. **9/6.**

Cathode-Ray Tube, VCR97. Instrument type. New **7/6** each, carriage 3 6.

Bakelite 5 Amp. Electric Wall Switch. "Micraft," 2d. each, or **8.**- per dozen.

Series, parallel and off-electric wall switch made by Crabtree. Price **1'3** each. or **13 6** per doz.

NOTE : Additional Technical Data is not available on these bargain items.

Amplifier, ex-Government unit 1131 contains one double triode and one triode. **6 6**, post and ins. 2 6.

Connecting Wire, P.V.C. covered 24 s.w.g. copper. **2.6** per 100 ft., or 5 coils, different colours, for **10/-**.

Scanning Coils by very good maker. New and unused. **4 6** complete.

Choke, 200 mA. first class. Made for Services. New **6'6**, post 1/6.

10 v. Superhet, 1½ metre. Ex-Govt. but unused. Complete with valves. Easily converted for Band III. **39/6**, carriage and packing 7.6.

Mains Transformer. 250-0-250, 60-80 mA, 6.3 v. standard mains input. Half shrouded. **12'6**. post and insurance 2 6.

R.F. 25 Tuning Unit. New, unused and complete with valves. **9'6**, post 2 6.

Cathode-Ray Tube, VCR517 **8 6** each, carriage 2/6.

Mains Lead. Metal screened to stop interference. **9d.** yard.

Thermocouple, mounted on valve base. Useful for experiments and schools. **6,6** each.

Midget Push-pull Input Transformer and push-pull output transformer to match. **8.**- the pair.

NOTE : Orders for small components over £2 are post free, otherwise please add sufficient.

THE OCTAVIAN HIGH FIDELITY AMPLIFIER

3 valve 4 watt with frequency response better than 40-15,000 C.P.S. Control panel size 8 x 2½in. comes fixed to chassis but is intended for independent mounting. Separate bass and treble controls giving fullest variation of cut and lift. Separate switch, absolutely no mains hum. Remarkable value at **£4/19/6.**

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).

A NEW DESIGN

SIR,—After reading many Problems Solved and Letters I have decided that one of the main drawbacks to television amateur activities is the inaccessibility of the chassis and tube of the average TV receiver. I would have thought it would have been much simpler for a set to be made in a hinged form so that it could be swung out in some way, or the front of the cabinet could be hinged. Alternatively, why could not the chassis be up on end so that removal of the back would expose everything—*including both cores of the coil*. Perhaps some reader has an answer to this in the form of a home-devised chassis design which would be of interest to those of us who like to try out new ideas, as I think this is the most fascinating part of the hobby. —G. BARNET (S.W.).

SPECIAL NOTE

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

AERIAL DEVICES

SIR,—In reply to reader Dixon's letter, which concerns a slip in my recent article in the August issue on aerial devices, the formula should have read:

Number of outlets minus one (Nominator)

Number of outlets plus one (Denominator)

In the case of 3 outlets we get $\frac{3-1}{3+1} = \frac{2}{4}$

therefore the value of the resistor is 75 times $\frac{2}{4} = 37.5$ ohms

I hope this will clear up any queries.—J. BROWN (Penryn).

SERVICE SHEETS

SIR,—In view of the recent correspondence on the capabilities of us amateurs, I would like to point out that in addition to a rather ill feeling towards us from dealers, etc., we are subject to very poor treatment from manufacturers *re* the supply of spares and service data.

Surely, if a person pays upwards of £100 for a televisor he is entitled to some information on same? But, with the exception of one large group of manufacturing companies (who, I am glad to say, are always most helpful), the majority of makers are unco-operative.

Judging by the reply to a request which I recently received one would think we were after the plans of a latest electronic guided missile, instead of those of a 4- or 5-year-old televisor.

Such sections of the public as motorists are certainly better treated in the matter of after-sales service.

Whilst on the subject of new televisors, can one of our manufacturers tell me why all 12in. models have magically become 14in. during the last year or so? ("Elastic" tape measures for screen size?) —R. PURDY (Brighton).

R.F.26 CONVERTER

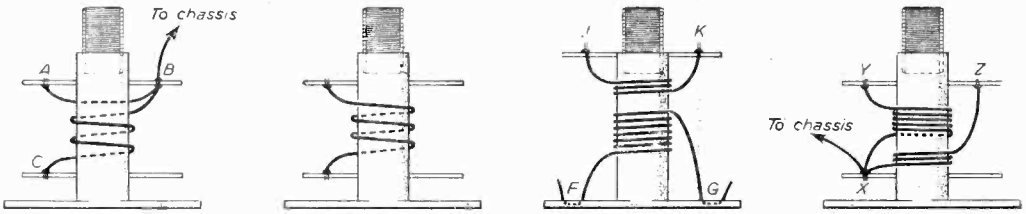
SIR,—From the queries received referring to the coil data, I feel a more general description would be useful to readers. For this purpose I give below a set of diagrams and a few descriptive lines which, I hope, will help.

The diagram shows the wiring of the coils. The enamelled wire, as used for the original coils of the unit, is suitable, and should be wound on the original formers, except L7 which is self-supporting. The very thin wire which formed the 7Mc/s coil should be discarded and enamelled wire of similar gauge to that used on the other coils should be provided for L5, L6. The coil turns should give general coverage of Band I and III channels. Should peaking not be obtained during the tuning of a coil, ½ turn should be added or removed. The guide is: if brass improves, remove; if iron improves, add, and thus adequate tuning can be achieved. L2 at the bottom of page 55 ought to read L7.—H. DUCKWORTH (Cleveleys).

TUBE FAULTS

SIR.—In reply to your correspondent, H. F. Watts, in the September issue, I would suggest that the fault is not a tube fault, but a fault between valve 1 and the video amplifier.

The possibility is that an Anode Load Resistor is in the process of disintegrating and the fluctua-



A to B... L1
B to C... L2

L3
L4

F to G... L5
J to K... L6

X to Y... L9
X to Z... L8

The supplementary coil data for the R.F. 26 converter.

tions observed as stated in the daily chronicle of the viewing is due to this fault.

The eruptions occurring in the resistor would cause the alternately high and low picture. brightness, and locking. etc.

I would suggest that he thoroughly examines the anode load resistor of the video amplifier valve.

Another possible cause of the variations could be due to an intermittent short circuit along the H.T. line.

He should examine thoroughly, in good light, any places along the H.T. line where the insulated rubber-covered wire passes through a hole in the chassis, and also particularly where the wire passes near or crosses over any hot resistor. Where the H.T. wire may possibly become scorched, the rubber covering melted and become stuck against the body of the resistor, resulting in an intermittent short circuit. which becomes active with the rise of temperature or some other cause.

Two other possible faults are faulty aerial or a bad valve-pin connection.—HAROLD A. HILL (Liverpool).

SIR,—I was very interested in the "Tube Fault" article.

You say that the reception is—Monday perfect, Tuesday, faint picture for one-and-a-half hours, Wednesday perfect. etc.

The recurrent effect of one evening of good reception and one evening of bad seems to me to point to transmitter trouble. I, too. have experienced this degeneration of picture quality on alternate evenings and at first I put it down to fringe area reception. fading, night effect, etc. Could be that one group of BBC technicians are inferior to the group who are on duty on the evening of good reception.

A test with a good pattern generator will prove whether your TV receiver gives the required synchronism of frame and line hold. Black and white detail and brightness. Also make sure that your coaxial plug is a good. tight fit, and that braid and core are making good contact with the required connections of the plug and TV receiver. This is very important as coaxial plugs are mass produced and rarely fit with precision—consequently intermittent faults could result. i.e., weak signals. picture tearing, picture not holding. Then someone bangs the plug in and everything is all right again.

Maybe other readers could vouch for these alternate evenings of good and bad reception as I'm sure that a rational point-to-point appreciation by the liaison of Practical Television correspondence columns will put to an end this frustrating issue.—L. DOWNEY (Londonderry).

SIR,—I was interested to read the letters from Mr. Watts and Mr. Layton arising from my article on "Tube Faults," but I never expected to hear that anybody had seen all the faults I mentioned on one set!

I would endorse Mr. Layton's comments regarding the retention of the isolating transformer when fitting a new tube. Heater cathode shorts aren't what they were fortunately. and nowadays the video cathode follower—series heater arrangement makes such breakdowns a rarity as a tube would have to use brute force to overcome the "splash" that results from the unlimited flow of current.—H. PETERS (Thetford).

BAND III RECEPTION

SIR,—I have an old set which is for BBC only, and have recently been thinking about modifying it for I.T.A. There are several ways of attacking this problem, from the fitting of a 13-channel tuner, to the modification of the I.F. section and the fitting of a two-station R.F. stage. I wonder if any readers have experienced a similar problem and have a really satisfactory solution which they could pass on? A 13 channel is of little use to us amateurs. and the majority of those I have seen have the Band I signal at one point, and the switch has to be turned almost a complete revolution to get the Band III station. On the other hand, the two- or three-station tuner or R.F. stage would only call for a slight movement of the switch to change from one to the other, and I may try and use the Viewmaster tuner, although this would call for the modification of the I.F. section. Perhaps some readers could pass on their solutions to the problem.—J. GROVES (Cricklewood).

FAULT FINDING WITHOUT INSTRUMENTS

SIR,—I have been interested in the articles on this subject which have appeared in your pages and wonder if any more information in this direction can be given. I am very keen but cannot at present afford to buy instruments or television equipment. and have to put up with my commercial set. I should like to experiment and later build my own set. but until I have a good stock of test gear I will have to make do with the improvised or simple methods you have described. I should like to see further details, such as timebase testing with the aid of simple meters, and as a matter of interest I would mention that when my set went wrong recently I took a chance and removed the chassis. tested with a pair of headphones. and soon located a faulty valve in the sound section. This was replaced with satisfaction and I feel quite pleased to think I saved a visit to the serviceman with the set perhaps away for weeks—H. R. FELLOWES (N.1).

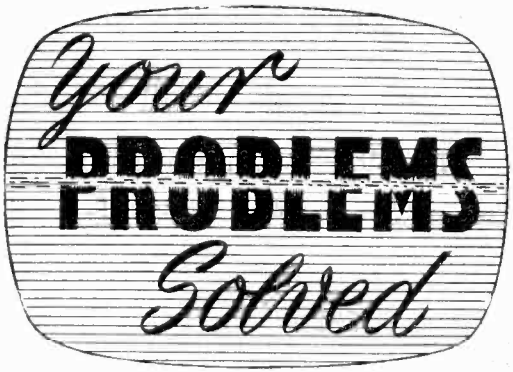
SCANNING AND SYNCHRONISATION

(*Continued from p.* 163)

mounted in a vice will be of assistance in speeding up winding operations.

When inserting the laminations into the coil former it is necessary to pack these fairly tightly. Due to the necessity for a gap in the magnetic circuit interleaving is not possible. and vibration of the outer laminations can set up an annoying "chatter" when the transformer is in use. An impregnation in ozokerite wax is also helpful in avoiding this and at the same time acts as a moisture seal.

Finally it must be remembered that a fairly intense stray field is set up by this transformer and care must be taken in the siting of this to avoid induced hum voltages in the early audio amplification stages or probably more seriously in the inductive components of the video amplifier. (*To be continued.*)



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

PYE VT17

No sound or vision. Previous symptoms: picture slow in resolving; top and bottom having an unfolding effect at edges. Loud crackling on sound when timebase came into operation and just prior to picture appearing.

Now no sound or picture. No raster. Screen remains dark. Timebase cannot be heard but valves light up when set is switched on.

I suspected the EY86 and replaced this valve but no change. Now suspect PL81 or PY81, or both.

I possess only a small test meter.—Leslie C. Ricketts (Dagenham).

The fault of no sound/no vision on your receiver is due to a defective metal rectifier. This is of the flat contact cooled type bolted to the side wall of the chassis, type number is indicated on the rectifier. The crackling previously heard as the timebase warmed up was due to discharge from the line output transformer of the EY86 EHT rectifier. The unfolding effect of the picture may be speeded up by advancing the brilliance control.

FERRANTI T136

This recently developed a white line down left of picture. I adjusted this out by line feed back control (line linearity). Set now out of action altogether as line o/p transformer became apparently overheated and developed a partial short in secondary windings. Am waiting delivery of new line o/p transformer from dealer.

Would like any maker's instructions reference to this control so that I may obviate any recurrence.—J. R. Warburton (Southsea).

We would advise you to remove the tube and scanning coils and replace the 150KΩ ½ watt resistor mounted on the coils with two 270KΩ ½ watt resistors in parallel. There are normally three resistors fitted, two 68KΩ (one shunted by a capacitor) and the 150KΩ mentioned. It would be as well to replace all three resistors if any doubt is felt, as they have a profound effect upon the line hold and linearity of the picture. You will find room for four replacement ½ watt resistors but the curvature precludes the fitting of 1 watt.

PYE B18T

With the brightness and contrast at minimum I get a very good and clear picture for the first ten minutes or so, then it goes very bright and misty. This has developed during the past few months since fitting a new line output transformer. Although it appears to be a grid to cathode short it seems to be O.K. when tested in accordance with the article on tubes in the September issue, and when I connect it as a triode I get a negative picture.—E. Warren (Romford).

We would advise you to replace the 2μF capacitor mounted on the paxolin panel to the right of the tube neck. The possibility of a heater/cathode short in the tube should not be overlooked although this, of course, would result in an extremely bright raster with no picture content at all. The brilliance control itself should be checked as it is common for this to become open circuited.

K.B. FV30L

This recently failed to give a picture (no picture or brightness). I have checked over the valves with a service sheet and find that the EHT rectifier valve fitted is a different one from the one quoted on the service sheet. The EHT rectifier fitted is marked R16 but the one mentioned on the service sheet is an EY51. Before I get a replacement valve could you tell me if they have the same characteristics and could you enlighten me as to the cause of the trouble. I might add that the set has been to a television engineer previously and he told me at the time that he fitted a new valve but did not mention what type.—A. Pring (Richmond).

Some FV30 models were modified to take an R12 (EY51) in place of the R16 EHT rectifier. The heater turns for the R16 are four, whilst the turns for the EY51 (R12) are 13½. There is no reason to suspect the valve if no spark can be drawn from the single wire end. In this case the line output, efficiency diode and line oscillator valves should be tested and the appropriate controls checked. Also check the continuity of the line oscillator transformer (associated with the 6J5).

PHILIPS 1100U

The picture is dull, and greyish, instead of black and white. *Advancing* the contrast control turns picture negative, *reducing* the contrast causes the frame to trip, and the picture rolls over, but immediately becomes much brighter, it continues to roll until the contrast is again advanced, then it locks and the picture loses its brilliance, outside interference will also cause the frame to roll, with the gain in brilliance, as already described. Do you think there is a fault

in the interference limiter? I should add that advancing the brilliance control makes the raster brighter, but completely swamps out the picture. The brilliance of the picture when seen at its best for viewing makes it necessary to leave the room light out.—C. E. Sweeney (Dartford, Kent).

Replace the high value resistors associated with the limiter control. The frame hold circuit is also related to this control, thus the 5.6 megohm resistor is to be suspected in the first instance.

VIDOR CN220

This set is proving rather expensive in valves, especially TY51s. The picture has a sooty appearance. The mains tapping, which was adjusted by the dealer when the set was installed, is on the lowest voltage range, presumably to effect picture hold. In the 230 v. position, picture either completely breaks up or is in triplicate, three of everything evenly spaced across the screen. I have a service sheet.—J. C. Cross (Blaina),

We suggest you replace the ECL80 sync separator—frame oscillator valve. If this does not effect an improvement, replace the 560KΩ resistor wired in series with the vertical hold control. The receiver should not be left at a low voltage tapping merely to obtain picture lock.

MARCONI VT73DA

Width, vertical hold and height are at end of slide left hand side, focus is completely clockwise to get a picture and this 1in. short at the bottom. It rolls for approximately 30 minutes before it settles down. I have replaced U35—R33 and R40, but with no improvement and I had to replace old R33 to be able to lock picture. I have the circuits of this set.—E. Turner (Wolverhampton).

Replace the B36 valve. If this does not improve matters have the KT36 line output valve tested. A contributing cause may be a low efficiency metal rectifier.

H.M.V. 3807

The sound is O.K., but the tube shows no raster for any brightness setting with or without the aerial. The U35 valve is O.K. and a spark can be obtained from the top cap of this valve and a much smaller spark from the anode of the tube.

On switching off the set a luminous patch appears momentarily in the centre of the screen as the set cools down.

Under the vision chassis one resistor is so badly burnt that I cannot replace it as I do not know the correct value; it is connected from pin 4 of the KT36 and pin 4 of KT33C, and seems to be 47——, the centre spot is burnt away.

I have very little test gear and no experience of TV servicing but can read circuit diagrams and do any necessary wiring of components.—R. B. Ennis (Preston).

The resistor you refer to is the 4.7KΩ screen dropping resistor of the KT36. We do not suspect this component at all and it is normal for it to appear burned.

We are more inclined to suspect the right rear Z77 video amplifier or a component associated with its valve base. It is quite common for this valve to develop an internal short, thus burning out its cathode resistor, which should have a value of 160 ohms.

FERGUSON 988T

My TV set has developed two black edges each side of the screen and no adjustments will put it right. These marks are an inch wide.

Also there has developed a black spot in the centre of the tube. What is the cause of this, or is it due to the black lines on the tube?—A. Ruffell (E.11).

We would advise you to have the PY82, PL81 and PY80 valves tested. One is almost bound to be of low emission, probably one of the first two. The mark in the centre of the C.R.T. is probably due to chemical discolouration unless an MW31-18 C.R.T. is fitted (instead of an MW31-16 or MW31-74), when the dark spot may be an ion burn.

BAIRD P1812

In the first instance the picture completely disappeared, the line osc. anode getting red hot (no osc.). The osc. 20P1 was changed, also the sync sep. 10F1 and efficiency diode U281. The picture would then disappear for a very short fraction of time then reappear quite normal. This happened approximately every five minutes. This could be partially rectified by increasing the value of screen resistor of the 20P1 from 4KΩ to 8KΩ and further improved by decreasing the value of the 22K res. in anode of sync sep. to 5K.

The right-hand side of the picture is now very cramped with 2in. between edge of picture and mask. I have a circuit diagram with values.—W. L. Lilley (Wye).

The right side cramping is no doubt due to the alteration in value of the 20P1 screen dropping resistor. We would advise you to return the circuit to that depicted in the circuit diagram. The fault is likely to be located in the sync separator circuit since the line timebase oscillations depend upon the arrival of line sync pulses.

PYE VT4

I have replaced the EY51 and PL81 because the picture fades out to a blank screen when the brightness is turned up. The picture narrows sideways before disappearing, the fault is still there, and also I cannot turn brightness right off, even with aerial lead unplugged; the picture is reasonably good and quite bright enough with brightness control right down, but the picture and verticals tend to shimmer about.—K. Hart (Beeston).

You will probably be able to improve this "blacking out" effect by careful re-adjustment of the ion trap magnet, which should be set to give the brightest picture with a setting of the controls which normally would make the picture

(*Continued on page 195*)

SETS & COMPONENTS

BAND III.—Responser ZC8931, 160/190 mcs., new, with valves, **15/-** (rail 8/6); Indicators, similar to 6A, 7 valves and VCR97, new, **30/-**, less case. **24/-** (rail 7/6); Test Set, 74, ideal for 'scope, 10 valves and VCR139A, with 50 cycle mains pack, fair condition, **45/-** (rail 8/6); RF Units, Types 26, 27, brand new, **25/-**; Type 25, **10/6**; Types 26, 27, damaged dials, **15/-** (post each above 3/6); Transformers, input 200/240v., outputs 12v., 3A and 5v., 3A, **12/6** (post 2/6); Rectifier Units, input 230v., AC, output 12v., 2A DC, cased, **22/6** (post 3/-); Vibrapacks, DC, 6v. to 250v., 80mA, smoothed, filtered, cased, new, **22/6** (post 3/6). Terms: cash with order. 3d. list/enquiries. W. A. BENSON, 136, Rathbone Rd., Liverpool, 15.

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

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

I.T.V. CONVERTERS from **£3/19/6**, self-contained, guaranteed, H.P. without fuss. Aerials from **14/6**. Trade enquiries invited. G. A. STRANGE, Dept. P., North Wraxall, Chippenham, Wilts.

TELEVISIONS, 9in. models **£7/10/-**, 12in. models **£13/10/-**, 12in. 5-Channel models **£19/10/-** each; all working; carriage paid. Send for list. TOMLINS, 127, Brockley Rise, Forest Hill, S.E.23. (FOR 5497.)

Elstone Transformers from M. FOY.

BUILD YOUR I.T.A. AERIAL from our machined parts. Supplied with folded dipole already made with insulator fitted, and cranked arm with clamp for any size of existing mast, or wall bracket. (State which when ordering.) Only a screwdriver needed to complete a rigid, waterproof array. 3 Element, **32/6**; 5 Element, **42/6**; 8 Element, **55/-**; post free. Lashing Kit if required, **15/-** extra.
Special Offers.—F.M. Indoor Dipole, complete on mast and base, **12/6**.
4 B.A. Steel Screws, ¼in. or ⅜in. long and 6 B.A. Steel Screws, 7/16in. long, all at **1/9** gross, post paid.
Polythene Insulators for ⅜in. rods, **4/-** each, post paid.
Illustrated lists of all Aerial Fittings, with Technical Data for Aerial Construction, all bands, **1/-** P.O. All goods post free. Write for details. SKYLINE WORKS, Burnsall Rd., Coventry. (Tel.: 60418.)

DO YOU EVER repair Radios and T.V.s? Then you require a Service Sheet. We have 1,000s and 1,000s of the actual ones used by the Trade, for sale or hire; s.a.e. with enquiry. You also require our new, larger Catalogue, packed with exact replacement and servicing components, price **1/-**. M. FOY, 6, Wykebeck Gardens, Leeds, 9.

New, Larger Catalogue from M. FOY.

5-CHANNEL TELEVISIONS: 12in. screen Ferguson 988, Ekco 161, etc., **£22** each. A good selection of 12in. T/Vs (London), 100% condition, from **£12**; 9in. from **£7**, also 12in. T/Vs, slight faults, from **£5**; 9in. from **£3**. TYLER TELEVISION, 63, Lee High Rd., Lewisham, S.E.13. (LEE 5979.)

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.

MAKING YOUR OWN? Telescopes, Enlargers, Binoculars, Microscopes, Projectors, or, in fact, anything that needs lenses. Then get our booklets "How to Use ex-Gov. Lenses & Prisms," Nos. 1 & 2, price **2/6** ea. Also our stereo book, "3-D Without Viewers," price **7/6**. Comprehensive list of lenses, optical, radio and scientific gear free for s.a.e. H. W. ENGLISH, Rayleigh Road, Hutton, Brentwood, Essex.

Replacement Components from M. FOY

TELEVISIONS, NEEDING ATTENTION, 9in.-10in. models **£4/10/-** each, 12in. models **£6/6/-** each, 15in. models and Philips Projection models **£11/10/-** each; immediate despatch; carriage paid. BARKERS, 325, Brockley Road, S.E.4. (TID 6752.)

TELEVISION TUBES, good quality, reclaimed and guaranteed for 6 months, as supplied to the trade throughout the British Isles. 14-15-16in., **£5**; 17in., **£6**; c.w.o. or pro forma. (Smaller sizes available, but in short supply. Enquire first.) TELETUBES, 34 and 18, Market Parade, Rye Lane, Peckham, S.E.15.

TELEVISION, 12in., out of order, **£5**; working O.K., **£10**; callers only. JOHN GILBERT TELEVISION, 1n, Shepherds Bush Rd., London, W.6. (SHE 8441.)

NEW AND USED VALVES and Components at low prices; all guaranteed; s.a.e. lists. Service Sheets, s.a.e. enquiries. Reconditioned Radios and T.V.s from **£2**, for callers. J. PALMER (PT), 32, Neasden Lane, N.W.10.

CATHODE RAY TUBES, used, but in good working order, and with 3 months' guarantee. All 12in. to 17in. Mazda, Mullard and Emitron types at **£4/10/-** each, plus **13/6** carriage. Orders and enquiries by letter only to: BHP DISTRIBUTORS, 379, Staines Road, Hounslow, Middlesex.

FOR SALE

SUPERTONIC SUNLAMPS, listed £7/10/-; **80/-**. S.A.E. SCIENTIFIC PRODUCTS CO., Cleveleys, Lancs.

SERVICE SHEETS FROM M. FOY.

TELEVISIONS, all sizes and channels, at lowest prices ever! Also a few tubes. Trade supplied. HYNES, 9, Cumberland St., Victoria, S.W.1. (TAT 9140.)

CO-AXIAL CABLE. Low loss ⅛in. dia. 7/0076, 75 ohm.; **7d.** yd.; c.w.o. under £2 add 1/6 p. & p. J. HARRISON, 26, Thurleigh Rd., London, S.W.12.

13-CHANNEL 12in. turret-tuned Sets, suitable any transmitter, **£25**, plus carriage; 14in., **£30**; many others from **£8**. C.C.W., 12 Dockhead, S.E.1. (BER 3756.)

"TELEVISIONS." 12in., 5 channel, tunable anywhere, models from **£19/10/-** each; carriage paid; satisfaction guaranteed. RYAN ELECTRICS, 134, Acre Lane, Brixton, London, S.W.2. (BRI 4533.)

UNREPEATABLE OFFER.—12in., 5 channel T.V., **£15**; 14in., **£22**; good working order. C. EDWARDS, 1070, Harrow Rd., London, N.W.10. (Phone: LADbroke 1734.)

TELEVISIONS, 12in., 5 channel, **£14**; 14in., **£18**; 17in., **£27**; Faulty Sets from **£2**. WILKINSON'S, 146, Goldhawk Rd., W.12. (SHE 4379.) Callers only.

ELECTRADIO.—Dual Wave Coil **2/6** with circuit, ditto, plus Reaction **4/-**, Tuning Condenser **3/10**, Crystal Diode **1/6**, tested 4 Transistor Set Circuit, **1/3**. All Transistor Components stocked. Post free. 18, Broadlands Av., Keynsham, Somerset.

SALE.—H.M.V. 1804 Spares; also non-working TVs. HOBDEN, Windy Mead, Potmans Lane, Bexhill, Sussex.

SERVICE SHEETS

SERVICE MANUALS/SHEETS. Tel/Radio for hire, sale and wanted. S.A.E. enquiries. W. J. GILBERT (PT), 24, Frithville Gardens, London, W.12.

SERVICE SHEETS, Radio, T.V., 5,000 models. Lists **1/-**, S.A.E. enquiries. TELRAY, 11, Maudland Bk., Preston.

WANTED

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

WANTED, Valves EY51, 6CH6, 10F1, PL81, KT61, 6F1, FW4/500, 20D2, 20F2, 10P14. Prompt cash. WM. CARVIS, LTD., 103, North St., Leeds, 7.

VALVES WANTED, EY51, EY86, PCF80, PCC84, PCL83, U25, 10F1, 10C1, 10C2, 10P14, 5Z4G. Prompt cash. Brand new only. R.H.S., 155, Swan Arcade, Bradford, 1.

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, R.T.E.B., and other professional examinations. Train with college operated by Britain's largest electronics organisation. Moderate fees. Write to E.M.I. INSTITUTES, Dept. PT28, London, W.4.

INCORPORATED Practical Radio Engineers home study courses of Radio and TV Engineering are recognised by the trade as outstanding and authoritative. Moderate fees to a limited number of students only. Syllabus of Instructional Text is free. "The Practical Radio Engineer" journal, sample copy **2/-**. 6,000 Alignment Peaks for Superhets, **5/9**. Membership and Entry Conditions booklet **1/-**. All post free from the SECRETARY, I.P.R.E., 20, Fairfield Road, London, N.8.

BUILD YOUR OWN T/V and learn about its operation, maintenance and servicing. Qualified engineer-tutor available while you are learning and building. Free Brochure from E.M.I. INSTITUTES, Dept. PT58, London, W.4. (Associated with H.M.V.)

11 + EXAMINATION.
Write for FREE 20-page GUIDE and Test, stating age of child to: THE REGISTRAR (Dept. M7), Mercer's Correspondence College, 69, Wimpole St., London, W.1.

just a little too bright to watch. This may not help your brilliance control trouble, which can be due to a leakage between tube electrodes or a lengthening of its grid base.

This latter seems most probable, as a lot of tubes go this way, and the best way of overcoming it is to lift the cathode potential of the C.R.T. by connecting it to H.T. via a ¼ meg. resistor to start with and working down until you get it just right.

A simpler method would be to remove R42 (150K) between cathode and chassis, but this may give rise to aircraft flutter if you live near an aerodrome.

ULTRA VA72

This is perfect in both sound and vision except for two parallel white lines about an inch apart down the centre of the screen. These are not visible on a dark background picture, but are very distinct in a light picture. A new thyratron valve has been fitted as the old one packed up. The tube is in good order also. Could you pinpoint the trouble?—James S. McWilliam (Huntly).

The vertical white lines indicate that the horizontal form control is incorrectly set.

This is located just to the right of the focus magnet on the top of the chassis.

PYE V4

I have bought a 13 channel converter Pye type 47 tuner. Could you please inform how and where to fit plugs and adapter valve holder; also which valves to remove. I have "Practical Television" August 1955 circuit on V4 model.—R. McKeever (Fulwell).

Remove the back, slip off the aerial panel (undo two screws, do not cut any wires), and remove the 5-channel knob. Take out the three valves running alongside the back of the set behind the tuner spindle. Reading from left to right these are ECC82, EF80, EF80. Put the right-hand EF80 together with the knob and aerial panel in a bag and tuck them away down the side of the chassis. These will come in useful if you unconvert the set for servicing.

Take out the black adaptor mounted on the side of the "tin box" from the 47 unit. Plug it in the left valveholder and replace the ECC82 on top of it. Plug the "tin box" into the centre holder and the EF80 into the side of the "tin box." Plug the remaining power lead into the right-hand holder. Test, and if O.K., mount unit on set back.

MURPHY V210

Both picture and sound went off. On examination I found H.T. fuse blown and heater cathode short of U281. U281 was replaced with Mullard equivalent (CY31?), also two valves on top deck. 10C2 and 20L1 replaced. Timebase now works when switched on and picture appears on tube. U25 heater lit but after a few minutes heater of U25 starts going dull with the result that the picture disappears and will not come on again without switching off and letting it cool down, and then switching on again. H.T. fuse replaced and remains O.K., but still no sound; speaker and output transformer test O.K.; not even a buzz on the sound.—F. Finley (Manchester).

To our knowledge there is no direct equivalent to the U281. The CY31 is the equivalent to the U201, which is not a boost rectifier. This may be the cause of your picture trouble but will not account for your sound loss.

The first thing to check here is that the contacts between the loudspeaker and the tongues which protrude from the top and bottom chassis hoop are not open circuit. Then proceed to check around the sound output stage which is the 20P3 adjacent to the aerial plug.

This valve should have 123v. on its anode, 170v. on its screen, and about 9v. on the cathode. As the focus control is in the cathode of the sound output stage a fault in this part of the set would also account for your losing focus.

PHILIPS 1236U

This has lately caused the following trouble. The picture will not hold now horizontally, that is only about two-thirds, as it tries to go over to the right hand side, and any slight increase in brightness or contrast controls sends it right over. Preset width control and preset horizontal hold are now at end of travel.

I have a wiring diagram and have myself replaced C35 and R46 with no effect. Valves tested as O.K. No other fault.—B. N. Barnes (Croydon).

The most common causes of loss of line hold in the 1236U are, a defective PL81, low emission PZ30 or defective 6.8KΩ PL81 screen dropping resistor.

BUSH TV53

I.T.A. gives an excellent picture. On either aerial socket, however, BBC reception is poor and grainy, and although at one time a reasonable picture was received on the same aerial from Isle of Wight, no picture is now obtainable.

Is any tuning possible or must the unit be returned to makers?—E. Laurence (Tadby).

We would not advise you to interfere with the tuner unit in any way. If you are sure the aerial is in order and the BBC elements are correctly positioned, we would advise you to consult your local Bush dealer who will return the tuner unit to the makers if necessary.

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 19s., Abroad 17s. 6d. (Canada 16s.). Registered at the General Post Office for the Canadian Magazine Post.