MAKING A VALVE-VOLTMETER

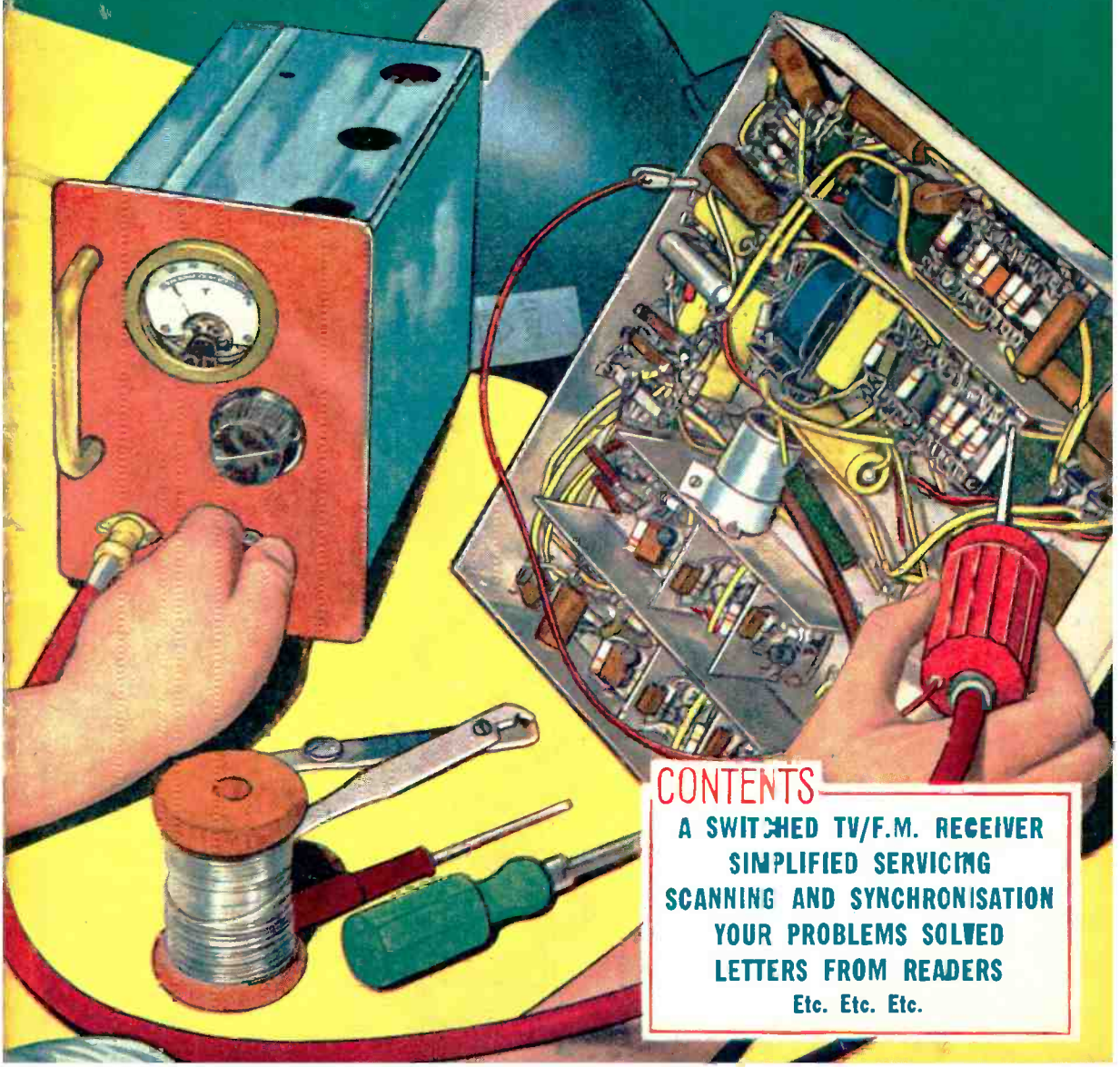
Practical Television

1/3

AND TELEVISION TIMES

JANUARY: 1958

EDITOR: F.J.CAMM



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1H5	11/-	6B7	10/6	6L7M	8/-	12AH8	10/6		30/-	CV428	30/-	ECC81	8/6	EZ80	9/6	PCL83	14/-	UCC85	10 6
1L4	6/6	6B8G	4 6	6L18	13/-	12AT6	10/6	35/51	12 6	D1	3/-	ECC82	7/6	EZ81	10/-	PEN40DD		UCH42	10.-
1LD5	5/-	6B8M	5 -	6N7	8/-	12AT7	8/6	35A5	11 -	D42	10/6	ECC83	9/-	GZ30	10/6		25/-	UCH81	11,6
1LN5	5/-	6BA6	7/6	6Q7G	8/6	12AU7	7/6	35L6GT	10/-	D63	5/-	ECC84	10/-	GZ32	12/6	PEN45	19/6	UCL82	13 6
1N5	11/-	6BE6	7 6	6Q7GT	9/-	12AX7	9/-	35W4	8 6	D77	6/6	ECC85	9/6	GZ34	14/-	PEN46	7/6	UF41	9/-
1R5	8/6	6BJ6	8 -	6R7G	8/6	12BA6	9/-	35Z3	10/6	DAC32	11/-	ECC91	5/6	H30	5/-	PL82	9/6	UF80	10/6
1S5	8/-	6BR7	11/6	6SA7GT	8/6	12BE6	10/-	35Z4GT	8 -	DAF91	8/-	ECF80	13/6	H63	12/6	PL83	11/6	UF85	10 6
1T4	7 -	6BW6	8,6	6SG7GT	7/6	12E1	30/-	35Z5GT	9 -	DAF96	10/-	ECF82	13/6	HABC80		PM2B	12/6	UF89	10 6
1U5	7/-	6BW7	14/-	6SH7	6/-	12J5GT	4/6	41MTL	8/-	DF33	11/-	ECH35	9/6		13/6	PM12	4/-	UL41	10 6
2A3	12,6	6BX6	14/-	6SJ7	8/-	12J7GT	10/6	50C5	12/6	DF91	7/-	ECH42	10/-	HK90	10/-	PM12M	6/6	UL46	15 -
2A7	10/6	6C4	7/-	6SK7GT	6/-	12K7GT	7/6	50L6GT	9/6	DF96	10/-	ECH81	8/-	HL23	10/6	PY80	9/-	UL84	11 6
2C26	4/-	6C5	6/6	6SL7GT	8/-	12K8GT		61BT	15 -	DH63	8/6	ECL80	14/-	HL41	12/6	PY81	9/-	UY41	8 6
2D13C	7/6	6C6	6/6	6SN7GT	7/6		14/-	61SPT	15 -	DH76	7/6	ECL82	14/-	HL133DD		PY82	9/-	UY85	10.6
2X2	4/6	6C8	12 6	6SS7	7/6	12Q7GT	7/6	72	4 6	DH77	8/6	EF36	6/-		12/6	PY83	9/6	V1507	5 -
3A4	7 -	6C9	12/6	6U4GT	14/-	12SA7	8/6	77	8 -	DK32	15/-	EF37A	9/-	HVR2	20/-	QP21	7/-	VLS492A	£3
3A5	12/6	6C10	12,6	6U5G	7/6	12SC7	7,6	78	8/6	DK91	8/6	EF39	6/-	HVR2A	6/-	QP25	15/-	VMP4G	15 -
3L7	8/6	6CH6	7/6	6U7	8/6	12SG7	7/6	80	9/-	DK92	12/6	EF40	15/-	KL35	8/6	QS150/15		VP2(7)	12.6
3D6	5 -	6D6	6/6	6V6G	7/-	12SH7	5/6	83V	12 6	DK96	10/-	EF41	9/6	KT2	5/-		10/6	VP4(7)	15 -
3Q4	9/-	6E5	12/6	6V6GT	7/6	12SJ7	8/-	85A2	15 -	DL2	15/-	EF42	12/6	KT33C	10/-	QVO4/7		VP13C	7 -
3Q5GT	9/6	6F1	15/-	6X4	7/-	12SK7	6/-	150B2	15/-	DL33	9/6	EF50(A)	7/-	KT44	7/-		15/-	VP41	7 6
3S4	8/-	6F6G	7/-	6X5GT	6/6	12SQ7	8/6	807	7 6	DL92	8/-	EF50(E)	5/-	KT63	7/-	R12	12/6	VR150/30	9 -
3V4	9/-	6F6GT	8/-	6Z4/84	12/6	12SR7	8/6	866A	13 6	DL94	9/-	EF54	5/-	KTW61	6/6	SD6	12/7	VT61A	5 -
5U4	8/6	6F8	12/6	6Z5	12/6	12Y4	10/6	956	3 -	DL96	10/-	EF73	10/6	KTW62	8/-	SP4(7)	15/-	VT501	5/-
5V4	12/6	6F12	9/-	6/30L2	12/6	14R7	10/6	1203	7 -	DLS10	10/6	EF80	14/-	KTW63	8/-	SP41	3/6	W76	7 6
5X4	10/-	6F13	13/-	7A7	12/6	14S7	14/-	4033L	12.6	DM70	8/6	EF85	7/6	KTZ41	6/6	SP42	12/6	X61	12.6
5Y3G	8/-	6F16	9/6	7B7	8/-	19AQ5	11/-	5763	12 6	EA50	2/-	EF86	14/6	KTZ63	10/6	SP61	3/6	X65	12 6
5Y3GT	8/6	6F17	12 6	7C5	8/-	19H1	10/-	7193	5 -	EA76	9/6	EF89	10/-	L63	6/-	TP22	15/-	X66	12.6
5Y4	10/-	6F32	10/6	7C6	8/-	20D1	16/-	7475	7 6	EABC80	8/-	EF91	9/-	LN152	14/-	U16	12/-	X79	12 6
5Z3	12/6	6F33	7/6	7H7	8/-	20L1	13/6	9002	5 6	EAC91	7/6	EF92	6 6	MH4	7/-	U18,20	12 6	XD(1.5)	6 6
5Z4G	10/6	6G6	6 6	7Q7	9/-	25L6GT	10/-	9003	5 6	EAF42	10/6	EL32	5/6	MHL4	7/6	U22	8/-	XFW10	6 6
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6A8	10/-		3/-	7V7	8/6	25Y5G	9/6	AC6PEN	7 6	EB41	8/6	EL42	11/-	ML4	12/6	U31	9/6	XH(1.5)	6 6
6AB7	8/-	6H6M	3/6	7Y4	8/-	25Z4G	9/6	AC/HL/		EB91	6 6	EL81	15/-	ML6	6/6	U50	8/-	XSG(1.5)	6 6
6AB8	14/-	6J5G	5/-	8D2	3/6	25Z5	10/6	DDD	15 -	EBC33	7/6	EL84	10/6	MU14	10/-	U52	8/6	Y63	7 6
6AC7	6/6	6J5GTG	5'6	8D3	9/-	25Z6G	9/6	AC/P4	8 -	EBC41	10/-	EL91	5/-	OA10	12/6	U76	8/-	Z63	10 6
6AG5	6/6	6J5GTM	6 -	9D2	4/-	28D7	7/-	AP4	7 6	EBF80	9/6	EM34	10,-	OA70	5/-	U78	7/-	Z66	20 -
6AG7	12/6	6J6	5 6	10C1	15/-	30	7/6	ATP4	4 -	EBF89	9/6	EM80	10 6	OA71	5/-	U251	15/-	Z77	9 -
6AJ8	8/-	6J7G	6/-	10F1	15/-	30C1	14/-	AZ31	12 6	EC52	5/6	EY51		OC72	30/-	U404	10/6	Z719	14 -
6AK5	5/-	6J7GT	10'6	10F9	11/6	30F5	14/-	BL63	7 6	EC54	6/-	(Small)	12/6	P61	3/6	UABC80	15'-	Z729	14 6
6AL5	6,6	6K7G	5/-	10F18	12/6	30FL1	12/6	CK505	6 6					PABC80	15'-				

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Practical Television

& TELEVISION TIMES

Editor : F. J. CAMM

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CONTENTS :

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

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

TELEVIEWS

LIMIT ON ADVERTISING

THE Independent Television Authority has instructed commercial television programme contractors to limit advertising to eight minutes in the hour, and that the average must remain at six minutes in the hour. Although the Authority has previously stipulated an average of six minutes advertising in the hour, spot advertising rose by 60 per cent. last autumn. The conclusion to be drawn from this is that the Authority has decided not to draw on the Government grant of £100,000 in the new financial year, which was intended to assist in obtaining a proper balance in programmes. This Government offer, it will be recalled, is part of the £750,000 a year mention in the Television Act. It has already been rejected by four of the programme companies as being too small and unrealistic. The final decision whether to accept or reject could only be made by the Authority. In the third Annual Report it is stated that "As the year drew to an end, the Authority could not fail to recognise that the atmosphere in which it had been found necessary to press for a grant had been greatly changed by the marked improvement in the companies' advertisement revenues." Sir Robert Fraser, Director General of the I.T.A., said that next year Independent Television intends to make a further effort to cater for those who love the arts. He did not explain nor expound upon this theme. We can only hope that programme time is not wasted on those arty-crafty programmes which have been so severely criticised when the BBC put them out. The report shows an average operating income of £1,702,152 and that no further sums have been drawn from the Government.

Sir Robert made a passing reference to the speech by Mr. Gerald Beadle, BBC Television Director, by stating that in recent weeks ancestral voices had been putting Independent Television firmly in its place, awarding it a sort of second-class moral status, the innuendo being that I.T.A. is lower in character and aim than the BBC programmes. "To both services, the sound of applause is sweet, and the louder the sweeter. Both want the 'house full' signs out, not the shutters up. The conventional characters of Good BBC and Bad I.T.A. belong to the land of myth and fable. Already in news, politics, public affairs and religion, the I.T.A. has more regular programmes than the BBC." He went on to claim that the I.T.A. Political Discussion Programme "Free Speech," has an audience seven times bigger than the BBC Brains Trust and that the magazine "This Week" had twice as big an audience as the comparable BBC programme, "Panorama." "We do not talk about the taste of the mob, we talk about what ordinary people like. What some regard as the herd, we respect as the human family." These are sound words.—F. J. C.

Our next issue, dated February, will be published on January 22nd.

SIMPLIFIED TV SERVICING

4.—SETS WITH FAULTY I.F. AND R.F. STRIP

(*Continued from page 226, December Issue*)

Video Demodulator

THESE are either diode valves or crystal rectifiers. Troubles met with here are generally indicated by no picture. The faults are mostly either valves or crystal rectifiers. The easiest way out is to change them. Be careful when changing crystal diodes that heat from soldering iron is kept away from the body of crystal itself.

Having eliminated the remainder of the receiver and cleared, or found it clear, of faults, and there is still no vision and/or sound, we are now left with this part of the receiver to investigate. We will presume the receiver is a superhet and that therefore the vision strip has an I.F. section. A set that is a T.R.F. will be dealt with later.

In a superhet, there may be as many as four stages of I.F., of which sometimes one or even two may be common to both vision and sound. Therefore, if the fault be no vision and no sound, the section we will investigate first will be this common section. Should, on the other hand, the fault be no vision, but sound O.K., then we can ignore for the time being this common section and concentrate on the portion that is for vision only. This will be that part of the circuit between where the sound is tapped off and the video demodulator. Fig. 16 gives a typical arrangement. Looking at this diagram, we can see that if the fault is vision and sound, then we investigate V1, V2, V3 and intermediate transformers I.F. 1 and I.F. 2. Should the fault be no vision, but sound O.K., then it will be V4, including I.F. 3 and I.F. 5. Should it be vision O.K., but no sound, then it will be I.F. 4, and further on in the sound circuit.

Now, as in all other sections of a television receiver, the valves will be the first suspects. Having eliminated these, the components come next. The transformers should be checked for continuity and coupling and decoupling condensers substituted for known good ones. Voltages on electrodes of valves should be checked and compared with data given on the service sheet.

As this series of articles is written for the reader who only possesses a meter, realignment is out of the question. If, after thoroughly checking all components and it must be realigned, let it be done by a thoroughly experienced man equipped with the necessary apparatus and information to do it.

Warning

Do *not* try and realign the set yourself unless you know exactly what you are doing and have the necessary instruments and the alignment data. The chances of realignment equipped only with a meter are about as good as the treble chance in a football pool. You may perhaps be able to get signals but the bandwidth, which is essential to good reception, will be poor.

Valve Testing and Changing

When removing valves, especially those in tuned circuits, it is very advisable to mark the valve and the position in set from where it was removed. This is essential, as although present-day valves are as near as possible alike (of the same type), they do vary slightly in inter-electrode capacity. Now this capacity is part of the tuned circuit, so that casual interchange of valves can in some circumstances cause slight mis-alignment. Should a valve in a tuned circuit have to be replaced, it may be necessary *slightly* to readjust the I.F. that is connected with it. If great care is taken, this can be done, but remember only a very slight alteration will be necessary. A non-metallic trimming tool should always be used.

Instability

This fault will occur in the R.F. I.F. strip, and generally means no sound, no vision, only a flared screen and loud hissing on sound. It is often due to cathode decoupling condensers and also decoupling condensers in heater circuit going open. In replacing these use known good ones of the correct capacity and connect the earthy side to the same point where the old one was connected. This is necessary, as earthing points in a television receiver are critical, and you will notice that they are generally brought down to one point in each valve circuit.

R.F. and Oscillator Sections

Quite a number of sets have adjustments at the back for adjusting the aerial, R.F. and oscillator

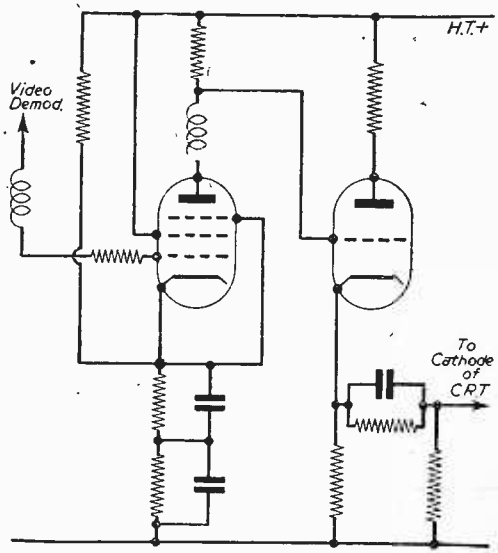


Fig. 15.—A typical cathode-follower video stage.

sections of the set. They are generally means of adjusting the position of the slug in the coils. In the case of sets for the five channels of Band I, there is often a cursor marked with the appropriate channels. This is naturally not dead accurate, but is only a guide, but it will generally be found that only a slight alteration is needed from the marked cursor.

Troubles here in this section will be applicable to no vision, no sound. Valves as usual should be checked, and in the case of the frequency changer, a known good one should be substituted. Coils should be checked for continuity, and also any controls, such as "sensitivity" or contrast, where it should be checked that the moving arm or slider is making good contact. In checking continuity of these controls, it is best to remove one end connection as in some cases there is a parallel circuit across, which will cause a wrong reading to be given on the meter.

Sets With Sound on Vision

This is a very common fault and it can be generally stated to be due either to too large a signal input, wrong adjustment of oscillator or sound rejector trimmer incorrectly adjusted.

In dealing with the first, it should be investigated if the sensitivity or contrast controls are in position where too much signal is being applied to the receiver. In the case of the second, the oscillator trimmer will need a slight adjustment. In adjusting this, it will be found that as one sweeps across the frequency width of the receiver, firstly vision on sound will occur (this is manifest as a low hum), then the correct position is reached and further on occurs sound on vision. In some sets the position of the oscillator will be found very critical. Pains should be taken to set this correctly, if good viewing is desired. As regards the last, most sets have a sound rejector circuit, which eliminates any residual sound being passed on in the vision circuit. A good method of adjusting this is as follows. Adjust line hold until it is nearly slipping then if there is sound on vision it will appear as a ragged edge. Adjust sound rejector trimmer until the ragged edge disappears. A slight adjustment of oscillator after this may be necessary. There is one other fault that may cause sound on vision, this is a microphonic valve. This can generally be cleared when sound volume is reduced. By the way, microphonic valves do not generally show up on a valve tester, so substitution is the best cure for this.

Sets With Vision on Sound

This is a fault similar to previous one, but which can be mistaken for ordinary hum, due to lack of smoothing. However, it can be checked, as if it is vision on sound, the hum will disappear when picture transmission ceases, whereas if it is ordinary hum it will still be there whether the programme is on or not. Causes can be, firstly, too strong a signal input, or faulty adjustment of oscillator, or faulty video valve or mismatched aerial and/or transmission line.

R.F. and Video Strip of T.R.F. Receiver

Although this type of receiver is obsolescent there are still many in use. Fig. 17 gives a typical circuit. It will be noticed that in this typical circuit only two valves are concerned with both sound and vision. Thus any fault that affects both sound and vision will be in the circuits of

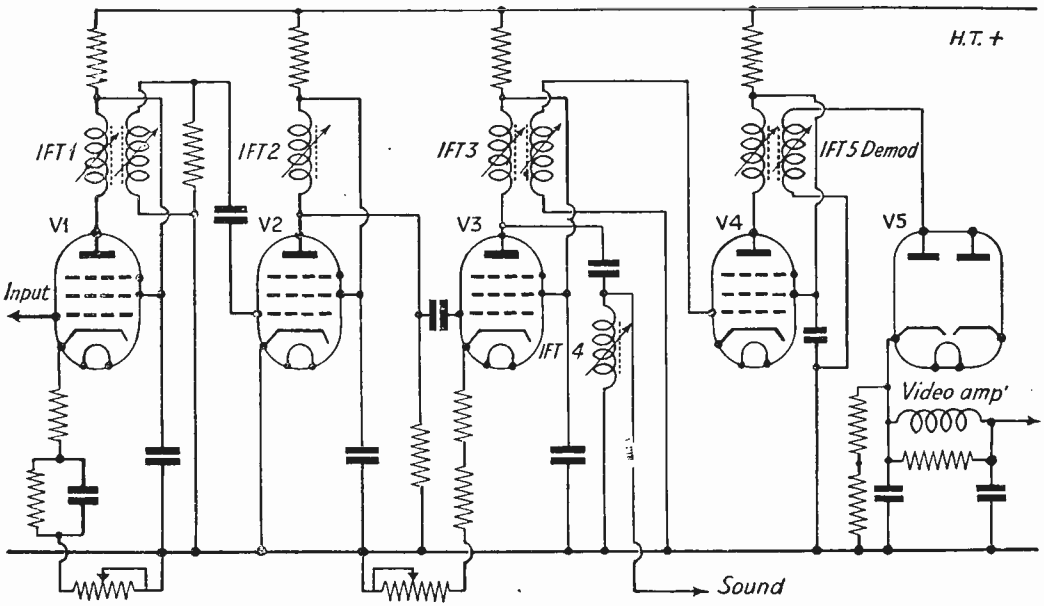


Fig. 16.—Typical S.Het. diagram. V1 is the R.F. amp., V2 the frequency changer, V3 1st I.F. (vision and sound), V4 second vision I.F., and V5 video demodulator.

these two valves, that is if all other things such as H.T. and heater supplies are O.K. The same procedure should be adopted as with a superhet. Check valves first and then components. The contrast control in the circuit given is in the cathode circuit of V1 and acts as a gain control for that valve. In some circuits it may be across the cathodes of the first two valves. Coils should be checked for continuity and particular attention paid to the cathode decoupling condensers. Voltages should be taken whilst varying contrast control.

Sound on Vision in T.R.F. Sets

This is generally caused by either to big a signal input, or mis-alignment, or incorrect setting of sound rejector.

Alteration of Trimmers

The same warning applies as with a superhet. All these radio frequency transformers are aligned on a different frequency to give the correct bandwith and indiscriminate altering unless the necessary instruments are available will result in either no signals or poor signals with insufficient bandwith. The only two trimmers that it is really safe to alter are the grid circuit of V1—R.F.T.1. and the sound rejector trimmer. Again non-metallic trimming tools must be used.

Vision on Sound in T.R.F. Sets

This is nearly always due to mis-alignment although too strong an input signal can cause it. In very bad cases a slight movement of R.F.T.2 towards sound may cure the trouble.

Thirteen Channel Sets

These sets include those with a tuner unit built into the set and those with an attached tuner unit or a converter

Taking the first type the receiver is very much the same as an ordinary superhet with the exception that the aerial, R.F. and oscillator circuits can be tuned to, or are pre-set tuned to any of the thirteen channels. The valves used are in most cases a double diode used as a cascode amplifier and a triode pentode frequency changer. This last valve changes the incoming frequency to the I.F. frequency of the set. Troubles here will generally be found to be valves, although as the channels are switched, trouble may be expected with switch contacts. Use a proprietary switch cleaner to do this job, rotating switch whilst applying. *Warning:* A lot of makers seal their tuning units and will not accept them for servicing if the seal is broken. My advice in this case is to send a faulty unit back to makers.

Sets With Converters

The most frequent of these is the type where the higher frequency channels are converted to the lower frequency Band I channel that the set is tuned to. Some have a power pack incorporated, and in others the H.T. and heater current is taken from the receiver. Here again, valve trouble or switch trouble will be the most likely cause of faults, although a check of components, and also the input and output circuits and connectors, should not be missed. In all these note that the frequency changer valve may show O.K. on a valve tester but is still not satisfactory in the set. This may be because the valve will oscillate perfectly at the lower frequencies but will not do so at frequencies of the higher channels.

(To be continued)

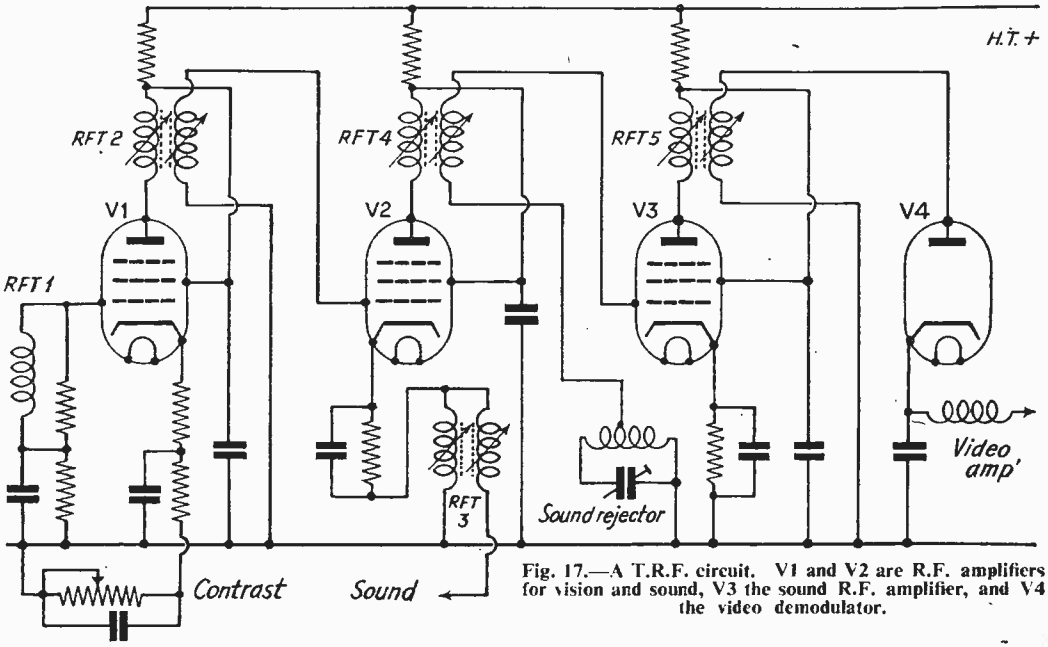
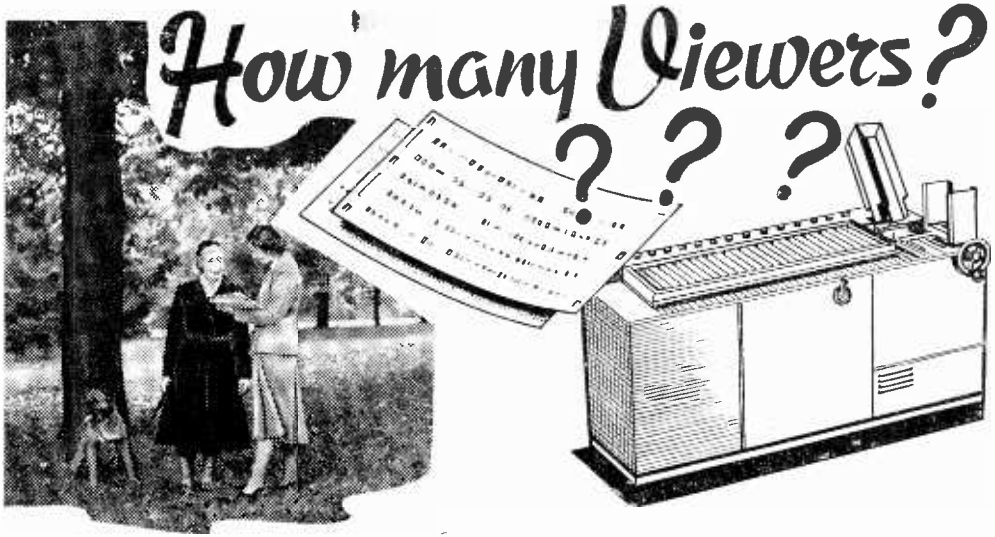


Fig. 17.—A T.R.F. circuit. V1 and V2 are R.F. amplifiers for vision and sound, V3 the sound R.F. amplifier, and V4 the video demodulator.

How many Viewers? ? ? ?



A BRIEF ACCOUNT OF THE METHODS OF ASSESSING THE SIZE OF AUDIENCES AS USED BY THE BBC AND I.T.A.

FROM time to time one reads in the daily press that a certain programme was watched by so many viewers to I.T.A. to the detriment of an alternative programme on BBC, only to see a few days later a contradiction by the BBC. At the annual meeting of the I.T.A. recently Sir Robert Fraser, for instance, said, *inter alia*, that "in homes able to choose between them, 'Free Speech' has an audience seven times bigger than the 'Brains Trust,' 'Youth Wants to Know' twice as big as 'Press Conference,' 'This Week' twice as big as 'Panorama.'"

Three or four days later the BBC issued a statement in which it said, "The BBC did not understand figures issued by Sir Robert Fraser in his press conference . . . in fact the audiences for 'This Week' and 'Panorama' are fairly equal, with rather more viewing 'Panorama,' on the average than view 'This Week.' Again . . . Sir Robert is reported as saying that I.T.V.'s 'Roving Report' has a larger audience in homes with a choice than the BBC's 'Hancock's Half Hour.' But a recent week—quite typical—shows 7 per cent. of the audience viewing 'Roving Report' and 17 per cent. viewing 'Hancock's Half Hour.' Sir Robert Fraser says Alan Taylor's last lecture was delivered to more people than saw 'It's Magic'—again, presumably in homes with a choice. The figures were: 4 per cent. of those homes heard Alan Taylor's lecture and 18 per cent. say 'It's Magic.'"

How do the respective authorities arrive at their figures? In the case of the BBC, personal interviewers are employed as will be described later, whilst the independent company use reports from an organisation known as Television Audience Measurement, who employ what may be termed mechanical methods. We therefore think readers would be interested in an explanation of these two systems, although such explanation must necessarily be brief. They can then draw their own conclusions as to the reliability of the statements.

The BBC System

Every day a cross section of the public are asked about their previous day's listening (or viewing). Every Sunday people are questioned about Saturday, every Monday about Sunday, every Tuesday about Monday, and so on. In this way every day's broadcasting is covered.

Sampling the Population

It is unnecessary to question more than a cross section of the population because, as has been proved time and again, a properly chosen "sample" can be a reliable guide. The survey samples the population by questioning about 2,800 people each day, and as they are different people every day this means that getting on for 1,000,000 people are questioned in the course of the year. But the question is always the same, "what programmes did you listen to (or view) yesterday?"

The questioning is done by BBC interviewers scattered all over the United Kingdom who record the answers they receive on special "log sheets" on which all the programmes broadcast are printed. It is the interviewer's job to see that the person being asked recalls his listening and viewing accurately. Each interviewer is told to question a certain number of people daily, and he is told the kind of people they must be—so many men, so many women, for example, so many of each age group, so many occupied people and so many unoccupied, etc. This is extremely

important, for the 2,800 or so people questioned each day must be a representative cross-section of the whole adult population.

Result of the Survey

As soon as each day's "log sheets" come back to the head office, the number of people recorded as listening or viewing is counted, broadcast by broadcast. These figures are then expressed as percentages of the number of people questioned. Thus, one broadcaster may have a "listening figure," as it is called, of 5 per cent., another of 10 per cent., or another of 20 per cent. But, thanks to the laws of sampling, these figures can be taken to apply to the whole adult population so that it is fair to say that a broadcast which has a listening figure of, say, 10 per cent., was in fact heard by about 10 per cent. of the entire adult population of the United Kingdom.

In addition there is a viewers panel which is a voluntary body, and consists of viewers of all kinds. It is organised on a "family basis," its membership consisting of 600 viewing families, each serving on the panel for three months. They complete questionnaires sent to them weekly.

Transferring the information received by interviewers to punched cards ready for the sorting machine.

The TAM Method

According to Television Audience Measurement Ltd. audiences need to be measured scientifically, on a minute-to-minute basis. This is done by means of a Tammeter, an electro-mechanical measuring device designed by them. This is, to all outward appearances an ordinary but attractive looking clock, suitable for use in the sitting-room or elsewhere. It has, however, a precision built movement and, connected to the back of the television set by a lead, it can be placed wherever required in the room.

At the back of the clock face and enclosed in a locked cabinet to which the householder does not have access is a specially designed tape which is fitted in conjunction with the mechanism of the clock. The mechanism is so designed that when the set is switched on, the particular channel to which it is tuned is recorded on the tape.

A BBC interviewer, with a complete list of the previous day's programmes, asks a visitor to London which, if any, had been seen or heard.

Tammeter tapes are collected and replaced each week by field workers. When the used tape is removed from the Tammeter, the field worker checks the time of the clock with a chronometer. The clock is wound and a new tape, marked with a datum line showing the time it is put in, is inserted.

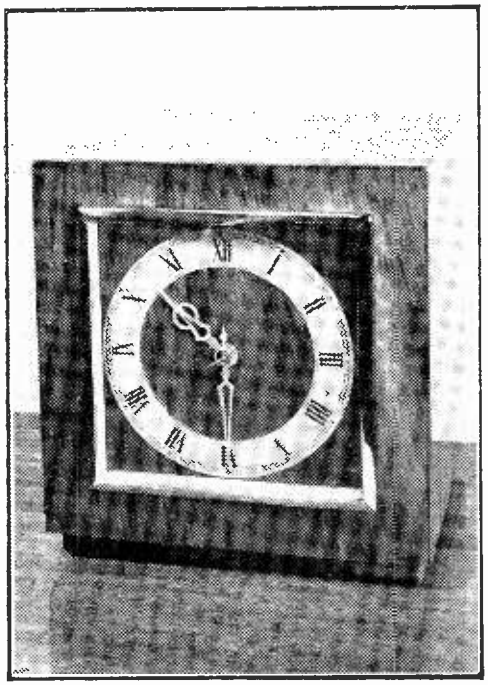
Analysis of Tammeter Tapes

The analysis of Tammeter tapes is done at the TAM Operations Centre at Berkhampsted, Hertfordshire. As tapes arrive from each I.T.V. area at the centre they are booked in on a Kardex system indicating the breakdown of the household, its social class, the number of children, the number in family, and the age of the housewife.

The tapes are then analysed on a Tamalyser, an electro-mechanical machine with a clock face and hands. The clock is set

to the time at which the tape was installed in the Tammeter and the datum line marked on the tape is set at the appropriate position on the Tamalyser. The tape is wound through and the Tamalyser gives an exact reading of the true time of when the television set was on and to which station it was tuned.

The information on the tapes is then transferred, together with the panel number, to punched cards, which are then passed through a verifying machine to bring to light any errors which may have occurred during this process.



The Tammeter, which looks just like a simple clock.

The punched cards are then placed into a mechanical sorter which places them in correct order, day-by-day and minute-by-minute. Next, they are transferred to a tabulation machine which produces a sheet recording, for each minute, the number of sets tuned (a) to BBC and (b) to I.T.V.

This sheet is used for the computation of comparative ratings known as Tamratings for (a) each fifteen-minute period (b) each complete programme, and (c) for the plotting of graphs in the weekly report.

These Tamratings are an arithmetical average of the minute-by-minute percentage of homes viewing in each fifteen minute period or watching a specific programme as the case may be.

Commercials

Tamratings are also prepared for each commercial. Where the commercials are less than sixty seconds the Tamrating represents the percentage of homes viewing for the particular minute in which the whole or greater part of the commercial falls. Where they last over sixty seconds, they are calculated on an arithmetical average as above.

Since a figure for the total number of homes able to receive I.T.V. is known from the random survey, Tamratings can be converted into homes viewing. So far as commercial Tamratings are concerned this enables the cost per thirty seconds per 1,000 homes reached to be calculated.

All relevant figures resulting from the analysis of Tammeter tapes are presented in weekly Tamratings reports.

Audience Composition

In addition to minute-by-minute programme and commercial Tamratings, it is important to know the actual composition of the audiences by persons. This information, too, is provided by Tam and is compiled from a sample of homes equipped with Tammeters and Tamlogs. Members of these households record individually in the Tamlog, which is connected to the Tammeter and is fitted with an electric reminder device, whether they have viewed during each fifteen minute period.

The completed Tamlogs enable Tam to measure the percentage of housewives and other members of each family on the Tamlog panel viewing at any particular time. This percentage figure is then applied to the number of housewives, children, etc., in those homes in which the Tammeters show the sets to have been switched on at that particular time.

By this means an accurate indication of audience composition broken down into the number of men, women, housewives and children, together with age groups for adults, is obtained. The panels who have the Tammeters were selected as follows:

How Panels Were Selected

The panel in the London I.T.V. area was established from the surveying of a series of large random samples of homes throughout the area. The first sample taken was in June, 1955, when 3,000 homes throughout the area were surveyed. In addition, in order to gain a complete picture of homes throughout the whole area able to receive I.T.V. programmes, a further 2,000 homes in the outer regions were surveyed.

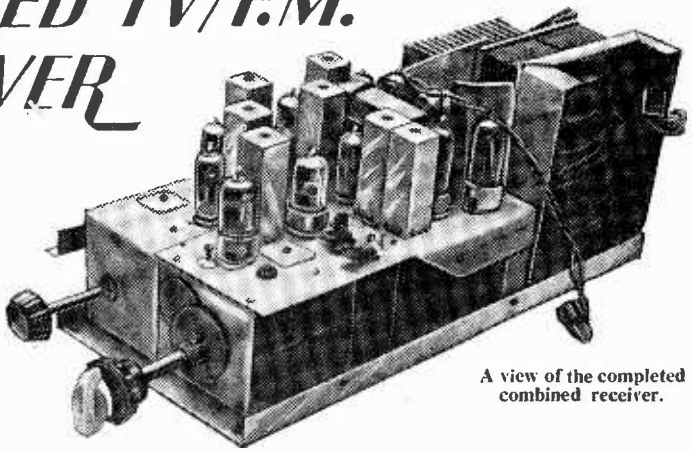
It was important that the field work for these random samples should be carried out scientifically and for this reason investigators entrusted with this work were previously trained to recognise the various types of television sets, adaptors, convertors and aerials, and to assess the quality of reception. It was their task to discover which homes in the samples had television; to examine TV sets found in the households visited, in order to determine whether the set was able to receive I.T.V. transmissions; and to assess, by having the set switched on, the quality of BBC and—when transmissions had begun—I.T.V. reception. To ensure that the households visited matched as nearly as possible the theoretically perfect sample which was selected in advance, up to six or seven calls were often made to make sure of contacting all the households selected.

A SWITCHED TV/F.M. RECEIVER

A COMBINED TV AND BAND II SOUND RECEIVER

By R. Shatwell

(*Continued from page 206, December issue.*)



A view of the completed combined receiver.

THE I.F. cans used throughout the set are somewhat taller than usual and were obtained from Radio Clearance in sets of three, wound for 34 Mc/s I.F. Seven are needed, but three sets were obtained. It will be found that if the connections to the side wires are unsoldered it is possible to force the existing windings along the former, and the sound I.F.s can be made up by so doing and removing a few turns as necessary. Other I.F. transformers can be made up using part of one winding, and the wire carefully removed from the other and used for the secondary. Only the discriminator transformer T6 and diode transformer T8 actually need a new start. These taller cans are not necessary in all cases, but their height protects the valves and enables the T bridge sound rejector to be in a common can with its input coil. The two spare cans will no doubt prove a useful addition to the spares box. T7 contains C44, C47 and C48 and care is necessary to avoid shorts to the can. Fig. 11 gives the position of the base pins and the cans are 2¼in. high. The pin 2 position used in T6 and T7 necessitates the insertion of a wire in this position.

The coil table gives the pin connection, top and bottom of winding, and all necessary data, but Fig. 12 gives additional data necessary for the discriminator. The tertiary and centre tap of the secondary are joined inside the can. The pass band of the transformer is broader than good quality necessitates, as is the whole sound channel, to simply switch tuning.

The sound input may appear unusual in that no tuned circuit is used at V4 grid. There are several reasons for this. Firstly, two I.F. stages after the common I.F. provide ample output. Secondly, as the switching necessitates a fair amount of switching at I.F., a tuned input must be heavily damped to avoid instability. Lastly, even a damped input circuit increases sound channel selectivity to a degree that makes tuning critical. If the set is to be used by the household it must be accepted that it will invariably be turned to the switch position desired and the fine tuner normally ignored. The present circuit makes this possible, particularly on F.M., without the average listener noticing any ill effect, even though a slight movement of the fine tuner may be necessary for exact tuning. The circuit also has negligible effect on the video channel.

Before any I.F. cans are fitted it is advisable to bolt down the tuner with 8 B.A. bolts, and then from the spare switch a length of actuating rod is cut, sufficient to extend from the existing rod to the rear of the chassis. Position a switch plate in alignment on the rear of the chassis, facing forward. Make certain that the contacts are in alignment throughout the full range and mark through the fixing holes, which should be at the position shown in Fig. 10.

The two wafers here need simple modification as shown in Fig. 6 (B and C) for wafers 8 and 9 respectively. Wafer 8 needs the contacts removing at the F.M. positions, this being neater than leaving them blank. Wafer 9 switches the heater line to video and timebases, and it was with some trepidation that a trial was made of the capabilities of a single contact. It was found that that would make, break, and carry 5 amp. at 6.3v. without heating or measurable voltage drop. To provide a good margin this wafer was modified to provide two contacts at all TV positions, making use of the stabilising contacts previously mentioned. This involves removing three contacts, refitting one in a new position, and moving the rotating contact to a new position, at the same time inserting another taken from the spare wafer. These can be removed and repositioned by *slightly* lifting the securing plates at the back of the switch. Removal of the spare one from the tenth wafer will make the process obvious. The fixed contacts are then all linked with 22 s.w.g. wire. Spacing between these wafers, and to chassis, is 3/16in. The linking of the actuating rod is made by a simple thin metal sleeve, bent about the joint and squeezed tight. No mechanical strain is involved. In all sketches the wafers are shown in the first TV position, the apparent change in the position of the actuating slot is caused by the fact that whilst wafers 1-7 face the rear, wafers 8 and 9 face forward.

Wiring

The I.F. cans. tag strips. and other fixed components can now be fitted and the heaters wired, sound and tuner to the input to wafer 9 and

video to the output from this wafer. Similarly the H.T. parts can be taken to the appropriate tag at the chassis rear. After the cathodes and all decoupling condensers have been wired in, along with the H.T. resistances to each valve, the general wiring can be completed. Note that C32 is repeated at T5 and T6. The tuner takes its H.T. and 6.3v from V3 and its adjacent tag strip.

The photos show the output transformer secured on top of the chassis between the video and sound stages, and it will be found that there is room here for a standard-sized component. No "tone correction" is fitted and quality is good, being nicely balanced and quite up to commercial standards.

This chassis completed the tuner unit should be bolted down and wired in. The interconnection consists of H.T. and 6.3v lines. V3 grid to T2, V5 anode, T5 and T6, and three connections to wafer 7. R27, R28 and C38 are wired between the wafer and the main chassis. The volume control is mounted on the main chassis and is ganged with the on/off switch. This is the only practical arrangement as this is the only control operative on both TV and F.M. The introduction of hum is avoided by screening the leads and by introducing the control after the L.F. stage. The switch leads should be of twisted flex taken with the screened leads in a straight line to keep them clear of the F.M. detector.

Power Supply

This follows standard practice, using a heater transformer but taking its H.T. direct from the mains via an RM4 metal rectifier. The transformer can be purchased or made up to the following data. Fig. 13 gives the laminations used but so long as the core area and winding space is correct use can be made of other types:—

Secondary watts $\left.\begin{matrix}10 \times 6.3\\1 \times 6.3\end{matrix}\right\}$ 70 w

Efficiency 80 per cent., therefore primary watts 87 w.

Core area 1.75 sq. in. or 1.4in. stack of 1.25in. centre limb.

T.P.V. 4.5.

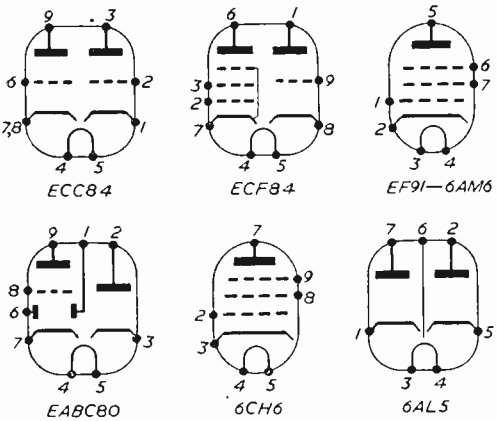


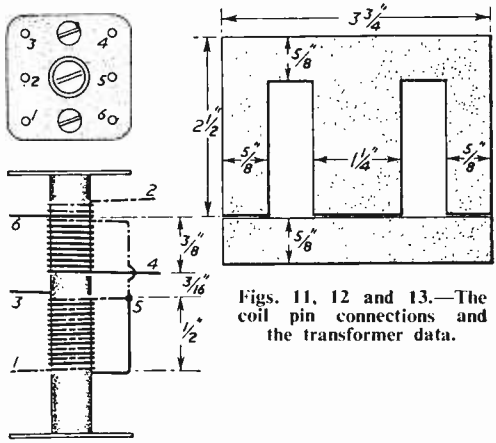
Fig. 14.—Valve base connections.

Primary 1025 of 28 s.w.g. enam. layer wound with tissue interleaving.

Secondary (1) 30T of 2 × 16 s.w.g. enam.

Secondary (2) 30T of 22 s.w.g. enam.

Primary and secondary turns are compensated for voltage drop and wire gauges assume home winding, which is rather less compact than the commercially-made transformer, and hence runs somewhat cooler. The 2 × 16 s.w.g. winding is simply wound, bifilar fashion, the ends being joined externally and is used to avoid cumbersome wire gauges.



Figs. 11, 12 and 13.—The coil pin connections and the transformer data.

Fig. 4 gives the circuit and Fig. 15 the under chassis layout. The choke is on the chassis top. RS, RV and RTB are small 5 watt types and should be adjusted so that HT(s) is about 180-190v, H.T. (v) 200v, and H.T. (TB) 190v. This is normally obtained with all three resistors about 350 ohm, but varies with the mains voltage and also with the condition of the rectifier used. Assuming a new rectifier and 240v. mains, 350 ohms will suit practically all cases.

18 s.w.g. aluminium is suitable for the chassis, and after the receiver and power supply are bolted together, the whole is made rigid by angle aluminium as shown in the photos. The fixing bolts for switch plates 8 and 9 pass through both chassis and the grommet holes must similarly be continued through each. The heater chassis connection from the transformer secondary should be made to a bolt passing through both chassis. The RM4 is secured to brackets on the transformer as shown in the photos. Note that its orientation is such that it is correctly ventilated in either horizontal or vertical use of the receiver. The only other point worthy of mention is that if possible the large capacity condensers should be reformed before use by being placed in series with a meter and about 150v. until the current flow has settled at a minimum, usually in about 15-30 minutes. If the voltage can be increased gradually to the working voltage so much the better. Although most condensers are now date stamped, it is surprising how heavy a current can be drawn if the full voltage is applied and storage conditions have not been good. All electrolitics, including bias condensers, etc., were obtained with the coil

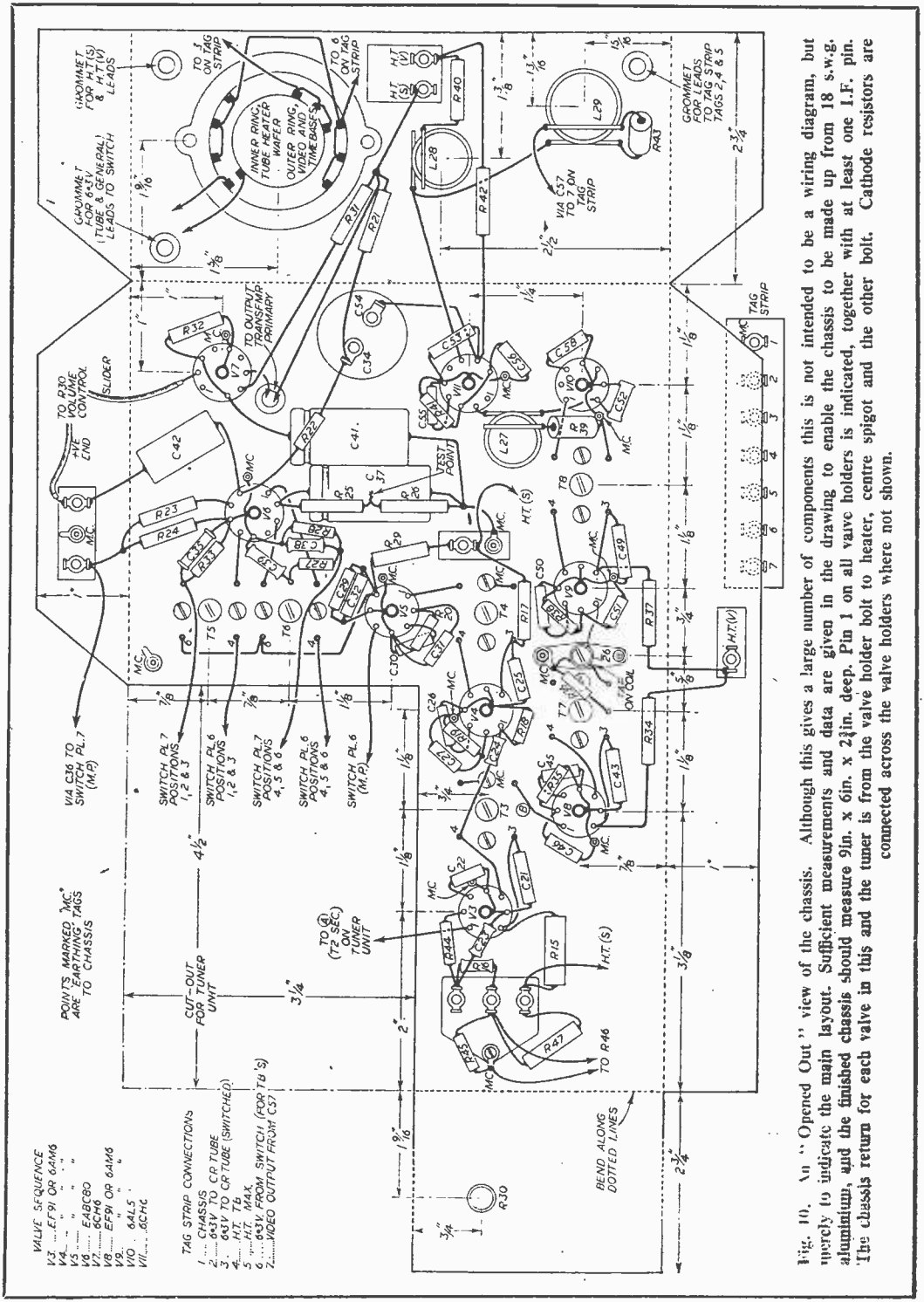


Fig. 10. An "Opened Out" view of the chassis. Although this gives a large number of components this is not intended to be a wiring diagram, but merely to indicate the main layout. Sufficient measurements and data are given in the drawing to enable the chassis to be made up from 18 s.w.g. aluminium, and the finished chassis should measure 9in. x 6in. x 2¾in. deep. Pin 1 on all valve holders is indicated, together with at least one I.F. pin. The chassis return for each valve in this and the tuner is from the valve holder bolt to heater, centre spigot and the other bolt. Cathode resistors are connected across the valve holders where not shown.

cans from a dealer in surplus, and would have been quite safe to use directly, as reforming was completed in a matter of minutes, but the practice is still a safeguard.

When heater and H.T lines are connected the set is ready for testing and the signal balancing wafer should have all fixed contacts earthed for the time being. At this stage it is advisable to insert a meter in the rectified H.T. before CR. Assuming no timebases are connected the current will be 90-110 mA approximately. If no cause for alarm and no untoward symptoms after a few minutes, remove meter and insert in video H.T. line. If this is in order, remove the meter and alignment may be started.

Alignment

This should be started with the sound channel as this is the channel used to establish the signal. For the sake of the household in general the speaker should be disconnected and the volume control turned down, lining up being done by phones connected across the volume control, isolated by two .1 uF condensers. Set the tuner to position 2. Inject 38.15 Mc/s at high level to V5 grid and align T5, move to V4 grid and align T4, reducing input as necessary, and again peaking T5. Repeat with generater at V3 grid. T3 should also be tuned to this frequency at present.

The phones should now be transferred to the video output (C57) isolated as before. Inject 36.65 Mc/s at V9 grid and peak T8. Move to V8 grid , and peak T7 primary at 37.5 Mc/s. T7 secondary to *minimum* at 38.15 Mc/s and L26 to maximum at 35 Mc/s. Transfer generator to tuner test point and adjust T2 to maximum at 36.65 and T3 at 35 Mc/s. If necessary, short R7 for this operation. With generator still connected here repeat alignment throughout, starting at T8.

Again move phones to the sound channel and check alignment here. Switch tuner to position 5. Leave modulation on and adjust T6PRI for maximum output and secondary for null point. This should be sharply defined, output increasing as it is approached then dipping, to increase again as it is passed. Repeat the lining up of this transformer until no improvement can be obtained. A more precise alignment can be made if a high resistance voltmeter on 10v. range is connected across C37 and T6 primary adjusted for maximum output. Transfer the meter to the junction of R.25, 26 and of R27, C39, and adjust secondary until meter gives a "nil" reading. Further adjustment will send the meter pointer backwards. For this method of lining up the generator must give an unmodulated output. The whole sequence should be repeated to ensure accuracy, as the cores may interact to a slight extent.

The phones should be left on the sound channel and the Band III signal should now be sought. Procedure here will assume the actual signal is to be used, and a flexible insulated lead should be connected to the aerial lead-in (inner conductor), and terminated in a prod of about 22 s.w.g. clean wire, hooked to enable it to be connected as necessary, and insulated with a sleeve up to the hook. The outer braid of the aerial lead can be connected to chassis, *but at all times ensure that the chassis is neutral and not live to earth.* If one channel is available on Band III it should be tuned on the second switch position, if two are available the highest channel should be on position 1, but it will be necessary to line up initially on the strongest available signal. The only other accessory needed is a "tuning wand" of insulated sleeving with a piece of iron dust core inserted in one end and a piece of brass in the other.

Connect the aerial hook to C^8 C^9 junction and adjust C15 for sound output, which should be within its range. If the harsh modulation of the vision channel is heard C15 needs closing

(To be concluded next month)

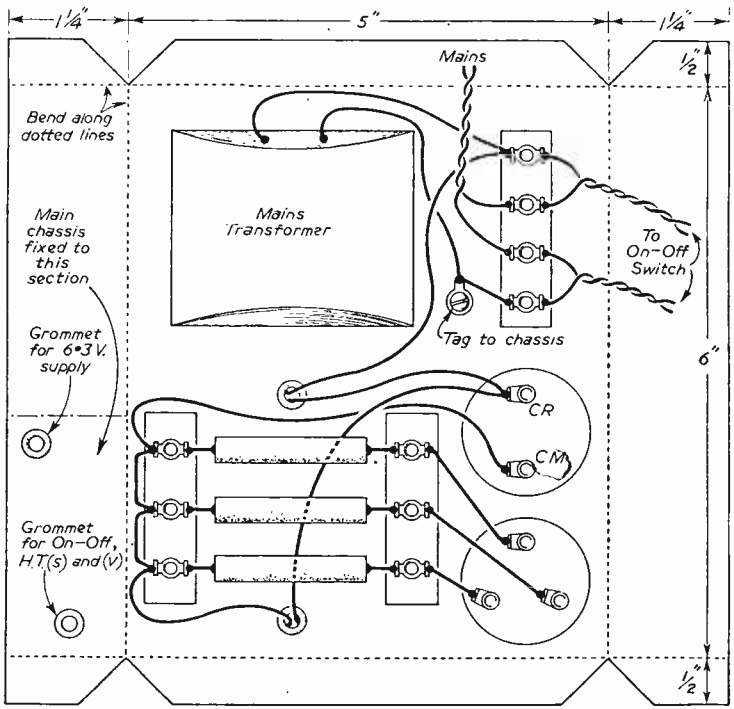


Fig. 15.—Wiring diagram of the Power Pack. The circuit appeared in the November issue.

FLYWHEEL SYNC. & A.G.C.

AN EXPLANATION OF THESE CIRCUITS, AND METHODS OF INCLUDING OR ELIMINATING THEM IN EXISTING RECEIVER CIRCUITS (2)

By H. Peters

FAULT finding in the Fig. 3 circuit given last month follows the general lines of the double diode type, but it should be noted that the sync. pulse is required to be positive going and so a stage of line sync. amplification is usually provided to get it the right way round. When disconnecting this type of discriminator it is better to take the 10pF sync. feed straight from the anode of the sync. separator proper, and to ensure that the coincidence detector does not have any effect on the line oscillator the link which transfers the control voltage to the oscillator should be disconnected. This may alter the range of the line oscillator, and the anode load of the coincidence detector may be required to be transferred as well to offset this effect and provide a steady potential at this point.

The explanation given for this system specifies positive going sync. pulses at the grid. In some receivers it is more convenient to feed in negative pulses, and it should be noted that the circuit works in a similar manner except that the sense of the control voltage at the anode is reversed.

Sinewave Oscillator Systems.

These are the true "flywheel" sync. systems, as the others already mentioned are more accurately called automatic phase control. Ideally the "flywheel" is a resonant circuit which almost oscillates at its natural frequency of 10,125 c.p.s., and which is shock excited into oscillation upon the arrival of the sync. pulses. One sync. pulse absent here and there will make little difference to the oscillation frequency, and the output of the "flywheel" can then be distorted until it is a square wave. This square wave is fed to the line oscillator as a sync. pulse instead of the one received from the transmitter.

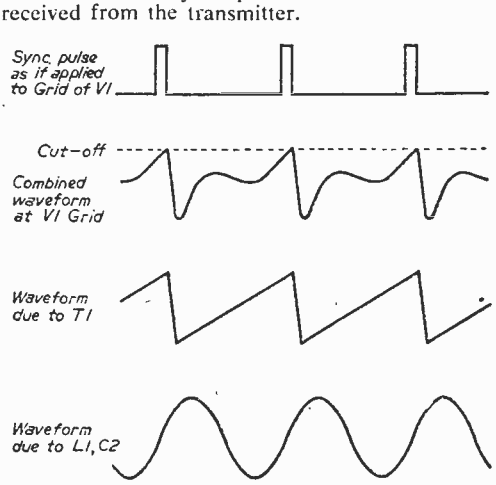


Fig 6.—The waveforms of the circuit in Fig. 5 on page 266.

This sounds so simple that there must be a catch in it somewhere, and there is. To prevent wavy pictures or "strobing" the transmitted system is locked to the National Grid by a counting system which is a kind of flywheel sync. system of its own. The frame sync. pulses (which are two to a line and thus twice line speed) or 20.250 c.p.s. are divided by 405, and the answer is 50 c.p.s., which is the nominal mains frequency.

If the National Grid is one cycle fast or slow the counting system automatically alters its sum to 20,655 ÷ 405 = 51 or 19,845 ÷ 405 = 49, and so the line frequency becomes 10,327½ or 9,922½ cycles per second.

A flywheel system sharply resonant at 10,125 c.p.s. would not be able to cope with these variations and so has little practical use. Another snag is that even if it was a working proposition there is no guarantee that the phase of the line timebase would coincide with the phase of the picture and this would cause the famous picture-cut-in-two effect known as "false lock." A practical circuit using a sinewave oscillator is given in Fig. 4.

On the face of it there is a marked resemblance to Fig. 2, but a closer look reveals at the outset that D1 and D2 both face the same way. Negative going sync. pulses are fed to the cathodes via ½ L1, causing each diode to conduct equally to build up equal and opposite voltages across R1 and R2 (which are also equal). So in the absence of any other influence, points X and Y are at the same potential and the junction of R1, R2 is zero. These sync. pulses are not integrated, in fact they arrive from the sync. separator through a large enough condenser to keep them substantially square in shape. T1 is the sine wave oscillator. It is cathode coupled and uses the screen, grid and cathode of V2 as its triode. L2 and C1 tune the circuit to line frequency and the sine wave output is fed in push-pull to the pair of diodes by L1. In the absence of sync. pulses the diodes conduct equally and alternately, causing points X and Y to wag alternately positive and negative equally and in opposition. The average voltage at these points is zero and so is the average potential difference between X and Y.

If we now quietly introduce the sync. pulses at the instant when the sine wave oscillator is passing through zero (i.e., in synchronism) the voltage between X and Y is the sum of the voltage due to the sine wave oscillator (zero), and that due to the sync. pulse (zero)—which is zero. Should the sync. pulses arrive slightly later one of the diodes, say D1, will be conducting and D2 will be cut off.

The pulse on the cathode of D1 will add to its total current, whilst the other one will get nowhere, D2 being cut off. The average voltage at X will thus become negative with respect to Y and can be used as a control voltage for the

system. If the sync. pulses arrive earlier than zero potential, D2 will be the conducting diode and Y will then be negative with respect to X.

In the diagram point X is tied down to a fixed bias and therefore Y varies up and down to provide the control voltage.

This is passed through the usual time constant filter, which is really the "flywheel" device (not T1, as one would suppose) to V1, which is a reactance valve, arranged so that a change of grid voltage produces a change of anode capacity. This variable capacity is effectively across L2, C1 and will vary the resonant frequency by small smounts to correct the difference between the line and sync. frequencies. The pentode section of V2 is designed to distort the sine wave produced between cathode, grid and screen, so that it approximates to a square wave with a sharp leading edge which is suitable for synchronising the line oscillator.

Horizontal hold is controlled in this circuit by varying the negative bias to point X, about which the reference voltage varies, and this is sometimes done by a control inserted in the grid leak of the line output valve. This can be mistaken on a circuit for the reference pulse fed back in A.P.C. systems and may at first give a wrong impression of the type of flywheel sync. employed. It will be noticed that the sine wave at D1 and D2 passes twice through zero each cycle, and this would appear to give the system a choice of two operating conditions 180 deg. apart.

Fortunately this is not so, as at only one of these points will the correction voltage work the right way. At the other one the D.C. developed will be in the wrong sense and will push the line oscillator off tune instead of locking it in.

The phase of the output waveform can be varied against the sync. input by adjusting the core of L1, and this has the effect of moving the picture sideways in the raster. The setting up drill is therefore important and is given here in preference to individual fault-finding tips.

First remove all trace of signal and with the width reduced, centre the blank raster magnetically on the screen with equal amounts of black edge all round. Restore the signal and make a bright under-contrasting picture. Remove the sync. pulses by shorting down point Z to chassis, and with the horizontal hold control set at midway adjust the core of L2 until the picture slowly runs through lock. Remove the short from Z and adjust the locked-in picture until it is in the centre of the raster by means of core in L1.

To change this type to pulsed sync. is not as simple as it looks; it is not sufficient to transfer the sync. lead from point Z to the anode of V2 and stop the sinewave oscillator, as the amplitude of the generated squarewave is great enough to be classified as "drive" to the line timebase.

In the Ferguson system the top half of V2 is indeed the left-hand valve of a multivibrator arrangement, and its free-running speed with T1 inoperative is very low and very harsh. Rather than set about redesigning the stage it may be better to increase the pull-in range by reducing C2 in the time constant circuit, or to permit T1 to oscillate at its natural frequency and to apply the sync. feed to the grid or cathode of V2 instead.

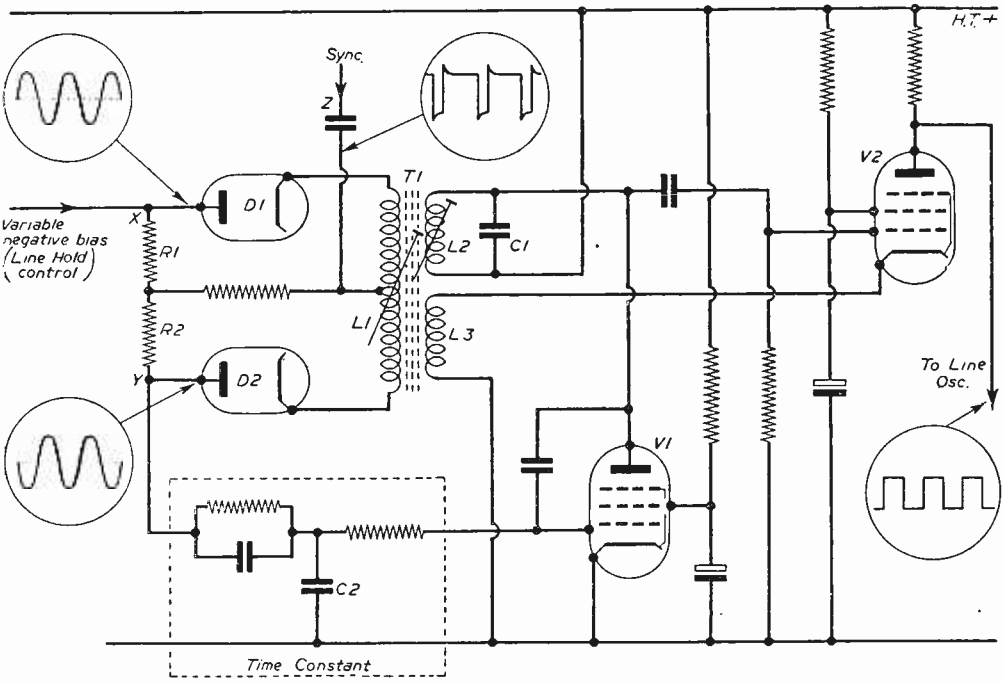


Fig. 4.—A sinewave system. V1 is a reactance valve, and V2 a cathode coupled sinewave oscillator, and pulse shaper.

Synchroguide System

The system shown in Fig. 5a has been developed by the Plessey Company, Limited, and is being fitted increasingly into British sets. Its virtues are simplicity, cheapness, and reliability, and in future years may well become the standard system.

V2 is a blocking oscillator using transformer T1 with C1, C3, R1, R2 in a conventional arrangement. V1 is a coincidence detector behaving similiarly to the one in Fig. 3, except that it is a triode and the control voltage is taken from its cathode. The two waveforms are applied to the grid and cathode.

L1 C2 is a tuned circuit resonating at line frequency which is shocked into damped oscillations by the output of T1. A combined sine-sawtooth waveform is fed through R3 to V1 grid, and its composition is illustrated in Fig. 6 with its two components drawn immediately below. Notice that the sawtooth and sine wave are added in a way that produces a sharply rising spike at the end of the line scan, and since V1 is biased well back by R3 R5 only the tip of this spike rises above cut-off.

V1 is thus quiescent except at that period, and even then cannot conduct fully. Incoming sync. pulses are shown on the same diagram (Fig. 6) as positive going and are assumed applied at the grid. In practice they are negatived and applied at the cathode, which you will recall, amounts to the same thing but saves manufacturers an inverting valve. The pulses are kept as square as possible and the free running speed of T1 is adjusted so that they coincide with the middle of the flyback time for correct locking. When the timebase runs below the sync. pulses will slide up the flyback line and more of them will appear above the cut-off line, causing V1 to pass more current and increase the voltage across to R2 R4. This increase is filtered by the usual time constant or "anti-hunt" circuit to V2 grid, where the rise in voltage will speed up the timebase and correct the error. You are invited to work out the case for the fast-running timebase yourself, assured that it behaves in an opposite manner, producing a negative change at V2 grid.

The Line Hold Control

The line hold control varies the anode voltage of V1, which alters the standing voltage across cathode resistors R2 and R4. This variation is used to control V2 grid in the same way as the correction voltage.

The saw tooth voltage to drive the line output stage is taken from the top of C3, which is the discharge condenser of the blocking oscillator. This keeps the drive free of the sinewave due to L1 C2, and as the anode load is taken to the boost rail, the saw tooth amplitude is sufficient for wide angle scanning and the timebase works on a reasonably linear portion of the discharge curve.

(To be continued)

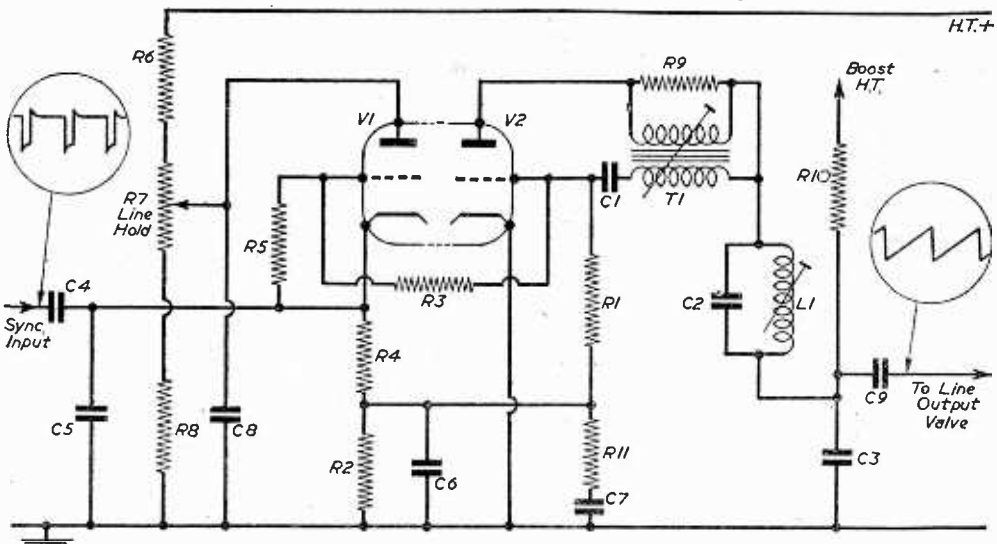
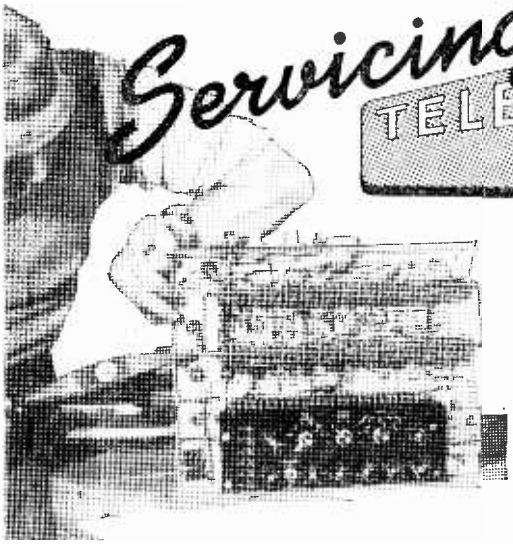


Fig. 5.—The Synchroguide. V1 is the coincidence detector, V2T1 the blocking oscillator, L1C2 produces damped sinewave at line frequency. (Courtesy of the Plessey Company Limited.)

LIST OF PARTS FOR FIG. 5

C1—560 pF	C6—.01 μF.	R3—270 K.	R8—27 K.
C2—.015 μF.	C7—.5 μF.	R4—120 K.	R9—47 K.
C3—1,200 pF.	C8—.1 μF.	R5—470 K.	R10—68 K.
C4—100 pF.	R1—150 K.	R6—33K.	R11—4.7 K.
C5—330 pF.	R2—100 K.	R7—100 K.	V1 and V2—ECC82 (or equiv.).

Servicing TELEVISION RECEIVERS



No. 34.—THE ULTRA VT917 AND WT917 (WITH NOTES ON THE ULTRA TUNER UNIT)

By L. Lawry-Johns

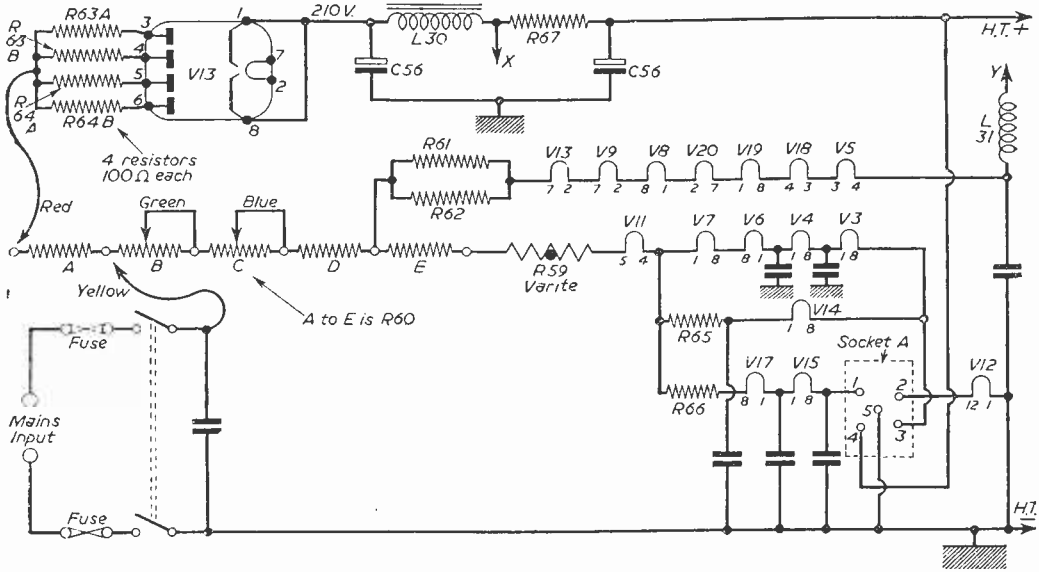
THE VT917 is a table model tunable to any of the five BBC channels and to two Band III channels. The WT917 is the same receiver in a console presentation. Both incorporate a separate tuner unit which is connected to the main chassis by two plugs (A and B. as shown in the diagrams). The C.R.T. is a 17in. Mazda CRM171. A similar receiver, the 915, employs a CRM142 14in. round tube.

These receivers are suitable for connection to either A.C. or D.C. mains. 200-250 volts. employing various types and ratings of valve heaters in a series parallel arrangement such as was mentioned in the last article on the K.B.

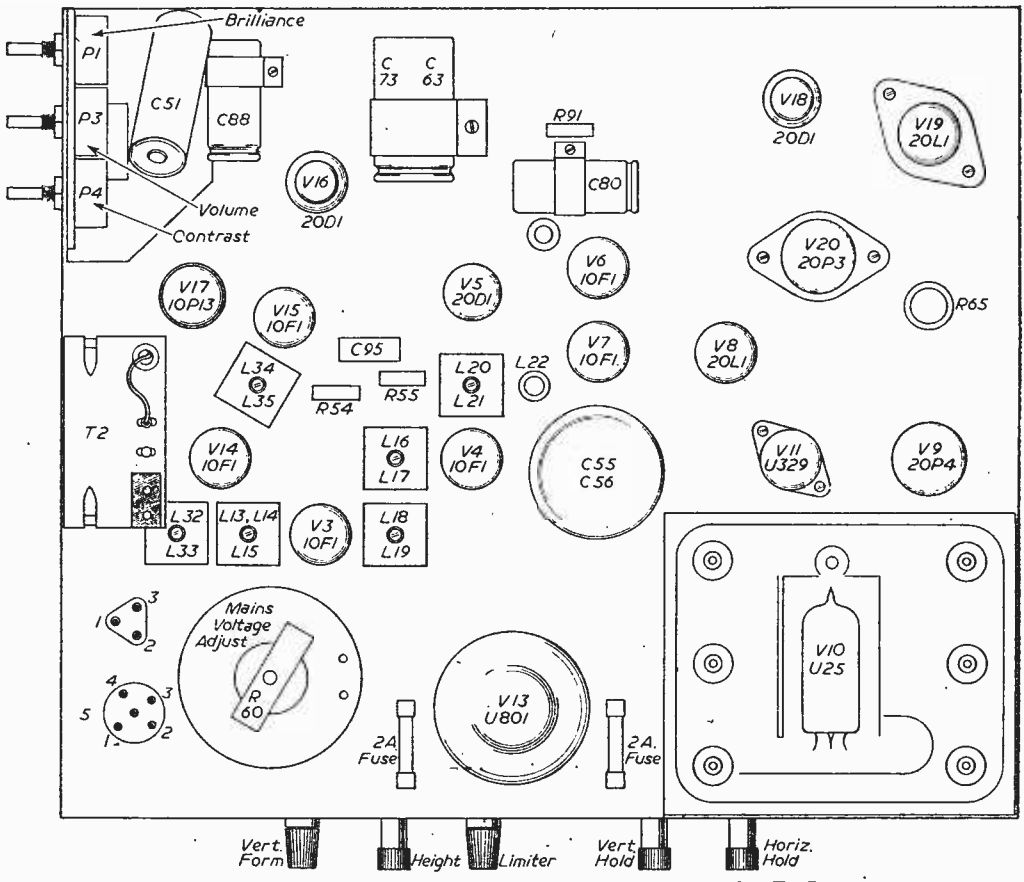
The heater circuit diagram may tend to appear confusing at first sight. but a short explanation. together with a close study of the diagram. should leave little doubt as to the part played by each section.

Early models had provision for an additional I.F. amplifier for fringe working. and where this was fitted resistors R15 and R18 are deleted. In later versions this I.F. stage is fitted as standard and therefore the resistors are not fitted, and pin 1 of socket A is now taken to pin 3. i.e., the connection between V15 heater and pin 1 of socket A is now taken to pin 3.

Inspection of the diagram shows a complete .2 amp series of valves 13-16 wired from R61-R62 to Y which point is the cathode (pin 1) of V16, the sound detector, which, from a heater current point of view, is at chassis potential. All the "20" series of valves are in this chain which, apart from the mains dropper, is independent of the other valve heaters. V11 is the first valve of the other composite chain. This valve (U329) has a .3 amp heater and this current is split into three .1 amp channels to supply the "10" series valves before application to the tuner unit



Power Pack heater circuit is completed when plug A of the tuner unit is inserted. L31 is joined to heater of V16.



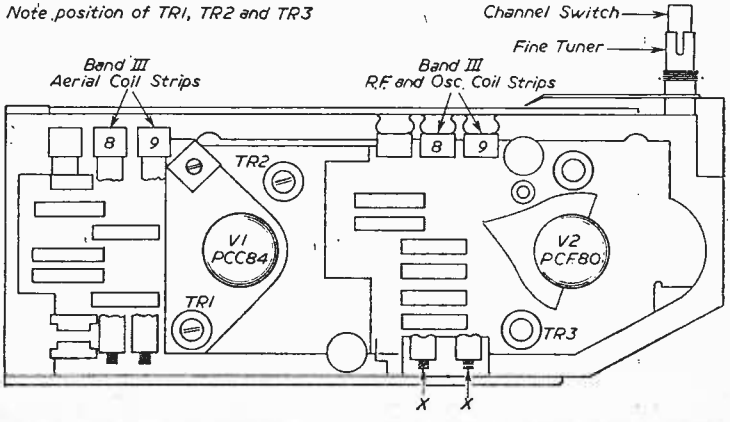
This is a top view of the chassis of the Ultra VT917 and WT917.

(PCC84-PCF80) .3 amp valves. This current is then applied via pin 2 of the socket to the C.R.T. heater. To anticipate a fault condition, let us assume that V11 heater fails. The .2 amp chain (all the "20" series) is unaffected and will appear normal. None of the "10" series will heat, neither will the tuner unit valves or the C.R.T. heater. The same conditions will obtain when any other .3 amp heater fails, i.e., the C.R.T., V1 or V2.

If, however, one of the "10" valve heaters fails, say, V6, the symptoms are likely to be confusing. V6, V7, V4 and V3 will be "out." V14, V17 and V15 will appear normal as will the "20" (.2 amp) chain. However, the loss of one of the .1 chain will result in V11, V1, V2 and the C.R.T. V12 being under-run. Thus the combination of possible fault symptoms may be worked out by studying the heater circuit remembering that on later models an extra 10F1 is included in series with V17 and V15, and that the wire from pin 8 of V15 is taken to pin 3 instead of pin 1.

A very common fault on this type of receiver

(*Continued on page 271*)



Top view of tuner unit with coils removed. Note position of TR1, TR2 and TR3.

C.R.T. ISOLATION TRANSFORMER

Type A. Low leakage windings. Ratio 1:1.25 giving a 25% boost on secondary :- 2 v., 10 6 ; 4 v., 10 6 ; 6.3 v., 10 6 ; 10.8 v., 10 6 ; 13.3 v., 10.6.
Ditto with mains primaries, 12 6 each.

Type B. Mains input 220 240 volts. Multi Output 2, 4, 6.3, 7.3, 10 and 13 volts. Input has two taps which increase output volts by 25%, and 50% respectively. Low capacity suitable for most Cathode Ray Tubes, 21 -. Ditto for 6 v. C.R. Tubes only, 17 6.

Type C. Low capacity wound transformer for use with 2 volt Tubes with falling emission. Input 220 240 volts. Output 2-2½-2½-3 volts at 2 amps. With Taz 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. Preferred values. 10 ohms to 10 megs., ½ w., 4d. ; 1 w., 6d. ; 1½ w., 8d. ; 2 w., 1 -.
HIGH STABILITY. ½ w., 1½., 2 -. Preferred values 100 ohms to 10 meg. Ditto, 10%., 6d.

½ watt	WIRE-WOUND RESISTORS	1 3
10 watt	25 ohms—10,000 ohms	1 6
15 watt		2 -

45,000 ohms—50,000 ohms, 5 w., 1/9 ; 10 w., 2 3.

12/6 PURETONE RECORDING TAPE

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FERROVOICE 1,200ft. Plastic Tape 25/- on Plastic Spools

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L.F. CHOKES 15-10 H. 60/65 mA., 5 - ; 10 H. 80 mA., 8/6 ; 10 H. 150 mA., 12 6.
MAINS TRANS. 350-0-350, 80 mA., 6.3 v. tapped, 4 v. 4 a., 5 v. tapped 4 v. 2 a., ditto 250-0-250, 22 6. Bargain 300-0-300 65 mA., 6 v. 1 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. o.5in. **FORMERS** 5937 8 a.f. (as TV1 2, ¾in. sq. x 2½in. and ¾in. sq. x 1 in., 2 - ea., with cores.
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MAINS DROPPERS. 3in. x 1¼in. Adj. Sliders, 0.3 amp., 750 ohms, 4 3. 0.2 amp., 1,000 ohm , 4 3.
LINE CORD. .3 amp., 60 ohms per foot, .2 amp., 100 ohms per foot, 2-way, 6d. per foot, 3-way, 7d. per foot
LOUDSPEAKER, P.M. 3 OHM. 2½in. square, 17/6. 5in. Goodmans, 17 6. 7in. x 4in. Goodmans, 21/-. 9½in. square, Elac., 21/-. 8in. Plessey, 19.6. 6½in. Goodmans, 18/6. 10in. R. & A., 30 -. TSL Tweeter, LS/175, 8 6. 12in. Plessey, 30/-. 8in. M.E. 2.5k field, tapped O.P. transf., 24 6. 15 ohm Plessey 10 w.t., 12in. with Tweeter, 97/6.
CRYSTAL DIODE G.E.C., 2 -. **GEX34, 4 -.**
HIGH RESISTANCE PHONES. 4,000 ohms, 16/6 pr.
MIKE TRANSF. 50 : 1, 3 9 ea. ; 100 : 1, Potted, 10/6.
SWITCH CLEANER Fluidm squirt spout, 4,3 tin.
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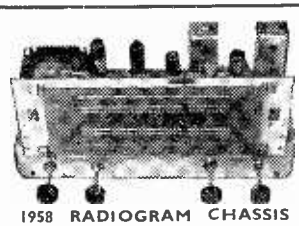
1S4	8/6	6L6	10 6	EBF91	10 6
1S5	8/6	6Q7	10 6	EBF80	8 6
1T4	8/6	6SA7	7 6	ECC84	12 6
2X2	3/6	6S67	8 6	ECF80	10 6
3V4	8/6	6V6G	7 6	ECF82	10 6
5U4	8/6	6V6GT	8 6	ECH42	10 6
5Y3	8/6	6X4	7 6	ECL80	8 6
5Z4	10/6	6X5	7 6	ECL82	12 6
6AM6	8/6	12A6	7 6	EF50	7 6
6B8	5/6	12AH8	10 6	EF41	10 6
6BE6	7/6	12AT7	10 6	EF50	5 6
6BH6	10/6	12AU7	10 6	Equip.	
6BW6	8/6	12AX7	10 6	EF50	5 6
6BW7	8/6	12BH6	10 6	Sylv.	8 6
6CH6	10/6	12BH7	10 6	EF50	10 6
6D6	7/6	12K7	8/6	EF92	5 6
6F6	7/6	12Q7	8/6	EL32	5 6
6H6	3/6	35Z4	10 6	EL84	10 6
6J5	6/6	80	8/6	EY51	11 6
6J6	7/6	954	1 6	EZ40	10 6
6J7	8/6	EA50	1 6	EZ41	10 6
6K6	6/6	EAB/80	8 6	EZ81	11 6
6K7	5/6	EB91	6 6	EL41	10 6
				EL42	10 6
				EL84	10 6
				EM1	10 6
				EM4	10 6
				EM34	10 6
				EM80	10 6
				EM81	10 6
				EY51	11 6
				EY86	11 6
				EZ40	10 6
				EZ41	10 6
				EZ80	8 6
				EZ81	11 6
				PC86	12 6
				PC88	12 6
				PC97	12 6
				PC900	12 6
				PCF80	10 6
				PCF82	10 6
				PCF84	10 6
				PCF86	10 6
				PCL82	10 6
				PCL83	10 6
				PCL84	10 6
				PCL85	10 6
				PCL86	10 6
				PD500	12/6
				PL36	10 6
				PL81	10 6
				PL82	10 6
				PL83	10 6
				PL84	10 6
				PL500	12/6
				PY80	10 6
				PY81	10 6
				PY82	10 6
				UBC41	10 6
				UCH42	10 6
				UF41	10 6
				UL41	10 6
				UY41	10 6
				U22	10 6
				U25	12 6
				U26	10 6
				U191	10 6
				U281	10 6
				U282	10 6
				U301	10 6
				U329	10 6
				U404	10 6
				U801	10 6
				VP23	10 6
				VP41	10 6
				VP133	10 6
				VP1321	10 6
				VP1323	10 6
				VR91	10 6
				VR92	10 6
				VR105	10 6
				VR150	10 6
				X61M	10 6
				X65	10 6
				X66	10 6
				X79	10 6



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4 SPEEDS—10 RECORDS
With Studio " O " pick-up
BRAND NEW IN MAKER'S BOXES
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Space required 14in. x 12½in. 5in. above and 3in. below.
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TRANSISTORS. Audio, 10 -. R.F. 2,6 Mc/s, 21 -. Mullard OC 71, 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.

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Volume Controls
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80 ohm CABLE COAX
Semi-air spaced Polythene insulated. ¼in. dia. Stranded core. Losses cut 50%, **9d.** yd.
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COAX PLUGS ... 1 - **DOUBLE SOCKET** 1,3
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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 2¼in. Spindle. Values, 100 ohm to 50 K., 5 6 ; 100 K., 6 6.
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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. Close tolerance (± 1 pF.), 1.5 pF. to 47 pF., 1 6. Ditto, 1% 50 pF. to 815 pF., 1 9 ; 1,000 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.
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TUBULAR	TUBULAR	CAN TYPES
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2 450 v. 2 3	8 + 8 500 v. 4 6	16 + 16 500 v. 6 -
4 450 v. 2 -	16 + 16 500 v.	25 + 25 450 v. 5/6
8 450 v. 2 3	6 -	32 + 32 350 v. 4 6
8 500 v. 2/9	CAN TYPES	32 + 32 450 v. 6 6
16 450 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.
25 25 v. 1 9	64 350 v. 5 6	12/6
50 25 v. 1/9	500 12 v. 3 -	1,000 + 1,000/6 v.
50 50 v. 2/-8	16 450 v. 5 -	6 6

SENTERCEL RECTIFIERS. E.H.T. TYPE FLY-BACK VOLTAGE. K/3 25 2 kV., 5 - ; K/2 10 3-2 kV., 7 - ; K/3 45, 3.6 kV., 7 6 ; K/3 50 4 kV., 8 - ; K/3 100 8 kV., 14 6. 50 c.p.s. voltage, 50% of above.
MAINS TYPE CONTACT COOLED 250 v. 50 mA., 8 6 ; 250 v. 85 mA., 9 6. Selenium 300 v. 85 mA., 7/6.
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 6.
T.R.F. COILS A HF 7 - pair. **H.F. CHOKES,** 2,6.
FERRITE ROD 8in. x ⅜in. dia., 2 6.

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FULL WAVE BRIDGE SELENIUM RECTIFIERS: 2, 6 or 12 v. 1½ amp., 8 9 ; 2 a., 11 3 ; 4 a., 17 6.
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WAVECHANGE SWITCHES.
5 p. 4-way 2 wafer long spindle 6/8
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2 p. 6-way 4 p. 2-way 4 p. 3-way long spindle 3 6
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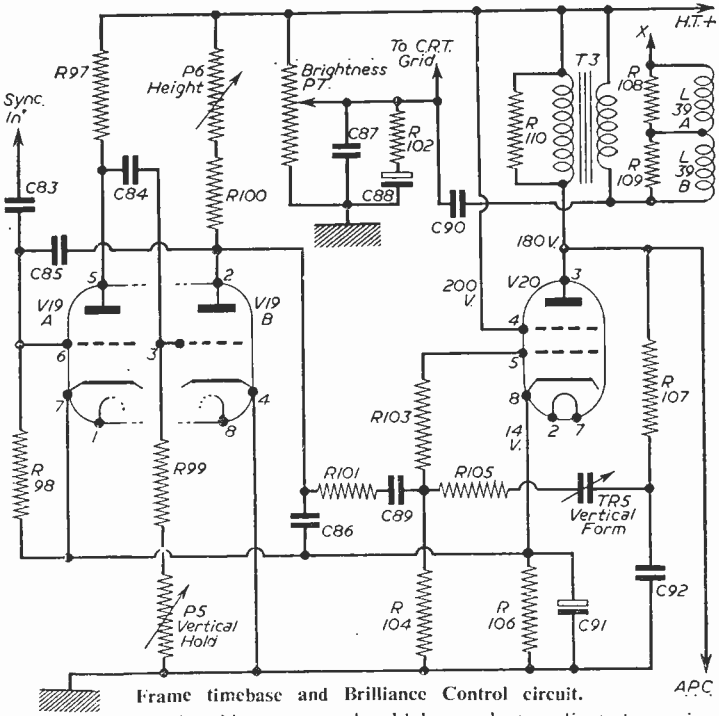
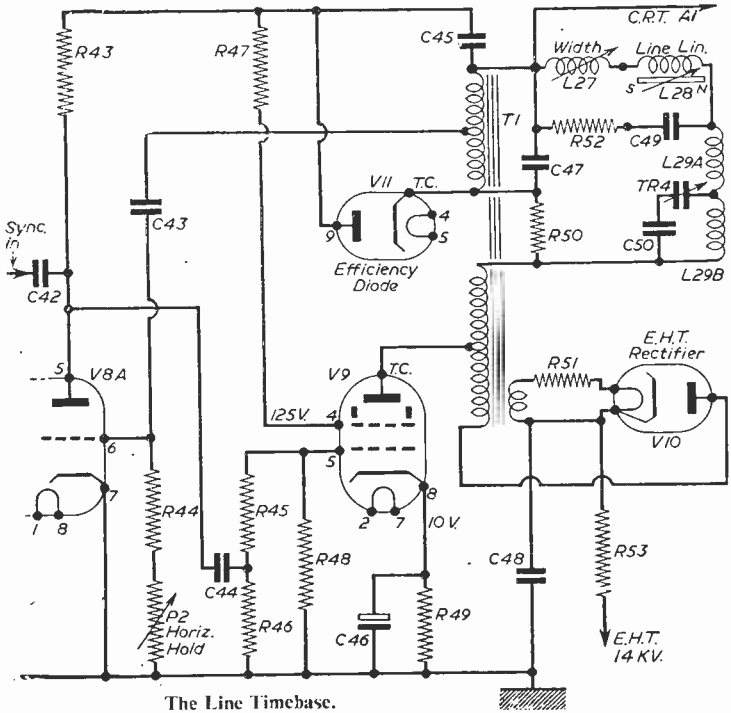
is improper contact between the coil studs and the springs in the tuner unit. This shows as intermittent signals which vary in strength and which are temporarily restored by operating the channel switch. This should not be confused with incorrect alignment which is artificially corrected by setting the switch at a "between" position. The springs may be adjusted but this is not advised unless it is really necessary since it is quite easy to distort the springs with the result that no signals will be received at all. If it is necessary, the tuner lid and bottom cover should be removed in the following manner.

Remove channel switch and fine tuner knob. Remove the plugs "A" and "B" and the three knurled nuts holding the unit to the side of the cabinet. To facilitate this, the tuner lid should be unsprung from the side and lifted off. This makes the removal of the upper rear nut easier. The bottom cover is removed by unscrewing the P.K. screws along one side and the front of the unit. No attempt should be made to adjust the springs until the coil carriage has been removed.



Frame timebase and Brilliance Control circuit.



The Line Timebase.

On the top front end of the unit is a P.K. screw securing a small plate which limits the travel of the carriage. Remove the plate and unspring the BBC (upright) oscillator coils. These are the coils with the three coloured tuning knobs. The carriage cannot be pushed to the rear far enough for the cutouts to engage in studs unless the coil bank is removed and the switch lever is disengaged (slacken screw and move lever along spindle). The switch lever is located under the unit and is attached to the switch spindle. Having removed the carriage carefully inspect the springs, clean and adjust slightly by increasing the bow of the spring if necessary. On no account must the springs be made too proud as this will cause the carriage to foul them and result in permanent damage. When the carriage is replaced, move it over the springs carefully to check this point before replacing the switch lever, etc. To

replace the BBC coil turret, engage the top and bottom retaining springs on the inside of the carriage first, push against these and clip into the other side slot.

To retune the coils, adjust the Band III section first. With the tuner connected and the top cover off, switch on the receiver and allow a good 10 minutes to warm up.

Switch to the desired channel, set the fine tuner to midway and adjust the oscillator coil core (whichever is in contact with the springs) marked X on the tuner diagram for maximum sound, with TR3 set so that its stem is some $\frac{1}{8}$in. above chassis. If signals are not up to standard, adjust TR1, TR2 and TR3 for optimum sound and vision. Note that the cores marked X are the oscillator coil cores Band III Channels 8 and 9. The other end of the same former carries the R.F. coils and thus the brass slugs at this end are for R.F. tuning complemented by TR2 and TR3. It is, therefore, not likely that these cores will require adjustment unless both Channel 8 and 9 are required, or if both coils are required to be set for the same channel. Band I tuning is somewhat simpler. Switch to BBC, set fine tuner midway, adjust red knob for maximum sound, yellow midway between maximum sound and vision, blue knob to maximum sound and the white knob to maximum vision. Before leaving the tuner unit it is pointed out that the two resistors at the rear of early versions are R15 and R18 which are not fitted to later models. It is normal for these resistors to run warm. A spare PCC84 should be kept as a slight deterioration in V1 can cause excess noise (picture grain) and weak signals, especially on Band III.

Circuit Description

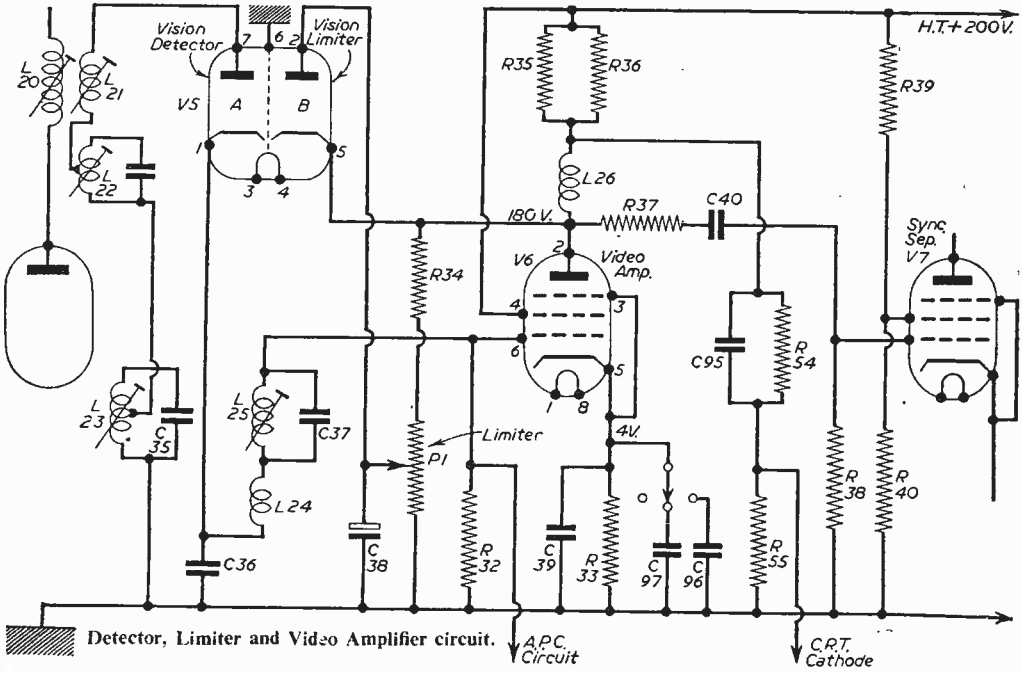
Signals are fed from the aerial socket to the aerial coils and to V1 where they are amplified in a cascode circuit. They are then passed via the R.F. coils to the V2 pentode mixer grid together with the triode section (oscillator) signal, the resultant signals appearing at I.F. at the pentode anode of V2, tuned by L10 and passed via plug B to the main receiver. The vision I.F. signals are passed via L13/L15, V3 (10F1), L16/L17, V4 (10F1), L20/L21 to V5 (20D1) for detection. L18/L19, L22 and L23 are sound rejectors. The sound I.F. signals are picked off by L14, applied via L32/L33 to V14 (10F1), L34/L35 to V15 (10F1), L36/L37 to V16 (20D1) for detection. Video signals are taken from pin 1 of V5 via L24 and L25 and are developed across R32 (4.7KΩ) in the grid circuit of V6 (10F1), the video amplifier. Video signals are developed across R35/R36 and are applied via C95/R54 to the C.R.T. cathode. The composite video waveform is also passed via R37/C40 to the sync. separator V7 (10F1) and also is directly coupled to the cathode of the interference limiter (V5B), the anode of which is "held off" by the limiter control P1.

A three position plug is incorporated in the cathode circuit of V6 and is located on the rear centre of the chassis. The correct setting is that which offers the best definition consistent with picture noise, grain, etc., i.e., local conditions.

A.P.C.

The automatic picture control circuit used depends upon the signal obtained from the control grid of the video amplifier, which, of course, varies with the picture content, and another obtained from the anode of the frame output valve. This latter pulse is of constant amplitude being that of the frame flyback.

(To be continued.)



Detector, Limiter and Video Amplifier circuit.

A Simple Valve Voltmeter

AN EXPERIMENTER'S UNIT BUILT IN AN RF26 CASE

By R. I. Jenkins (GW3DVG)

THE little instrument about to be described has proved to be a most useful addition to the test gear used for experiments, and is particularly useful to the TV experimenter. It is not elaborate, but it will be found to cover most of the useful measurements required by the amateur. One special advantage which attracted the attention of the writer to the circuit is the reversing switch to measure either negative or positive quantities. This facility has not been found in the simpler type of valve-voltmeter circuits which have been studied before this one was finally chosen for construction, and chiefly from a constructional angle the writer wishes to continue. No originality whatever is claimed for the circuit which is used, it is simple and completely self-contained.

The Circuit

The circuit is shown in Fig. 1. Resistors R1-R7 must be 1% one per cent. and one watt types were used for reliability over a long period. Switch S1 and the valveholder should be ceramic, again for the same reasons. VR1 is the zero setting control, and is mounted on the front panel, while VR2 is used to calibrate the full-scale reading, and is mounted on the chassis, because it should be unnecessary to move this again after calibration for long periods (e.g., after change of valve).

Construction

Looking around for a chassis for this instrument, a considerably "cannibalized" RF26 unit was found in the spares box, and this proved ideal for the job in hand. Firstly, the unit was completely stripped of all components, leaving only the screen running along one side and back-end of chassis. A hole was cut in the front panel to mount the meter, using an adjustable tank cutter. This proved to be the most difficult item of work, because two layers of metal had to be cut through.

The valveholder for the 12AU7 was mounted on a valve adaptor plate, and this plate mounted over the centre valveholder hole in the chassis. The resistor VR2 was mounted in the rear valveholder hole on chassis in a similar manner. An extension spindle was fitted to this control, and owing to the proximity of the rectifier (see illustrations), this was made of ¼in. round wood.

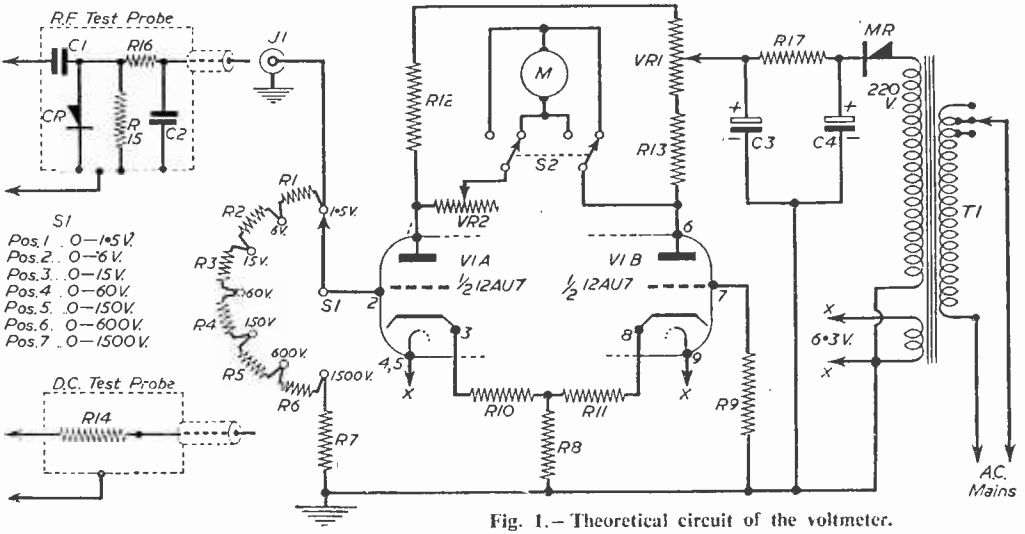
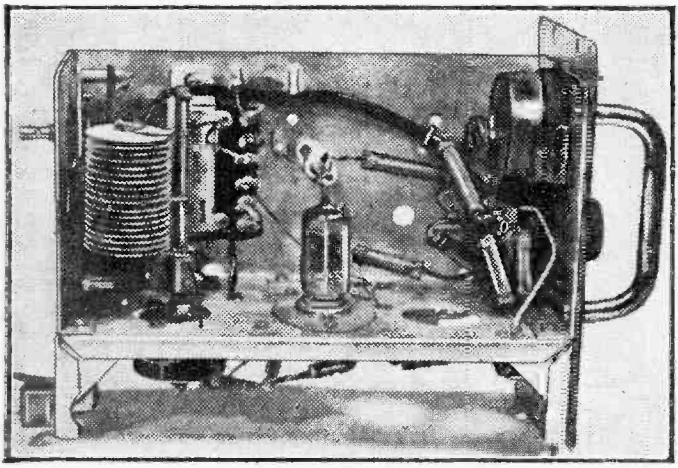


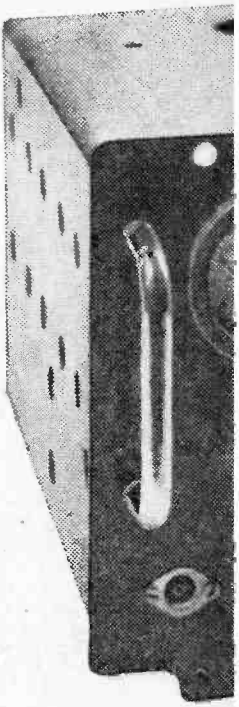
Fig. 1.—Theoretical circuit of the voltmeter.

Ebonite, or any similar material, could be used, as available. This spindle was made long enough to be level with top edge of screen and could be manipulated by finger and thumb without any risk of contact with the mains rectifier.

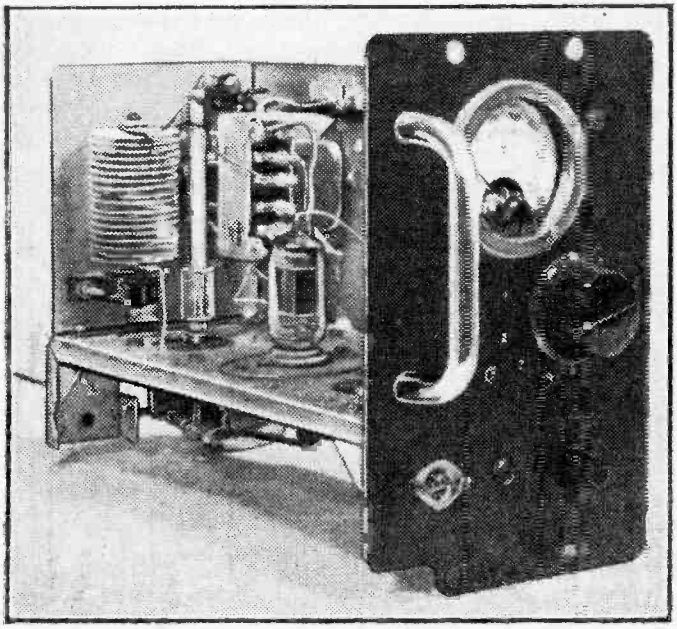


General layout of the chassis.

VR1 was mounted below chassis, on the front panel, and needs to be a small type of potentiometer, because of the limited space available. S2 was mounted on the back screen plate, behind the mains transformer, also the metal rectifier. Some of the resistors, R1-R7, were soldered to S1 before it was mounted on panel. R1 was made up of 2·5 MΩ resistors in series, and it was found advisable to support the central connection of these two on a ceramic stand-off insulator, to prevent them sagging and coming into contact with other resistors in the chain. (This also can be seen in the illustrations). The small mains transformer was mounted on the side screen plate near S2. The Jones' plug was completely removed from rear of chassis and a flex led in through space left, direct to mains transformer, no mains switch being provided as adequate sockets are available in the shack for plugging in various test instruments, the plugs being withdrawn when instruments are no longer required. J1 is a normal coax socket mounted on front panel. Insulated tag pillars were mounted where necessary below chassis to hold the components in position. Wiring was in no way difficult, no special precautions being found necessary.



The pan



View showing layout and panel.

The Probes

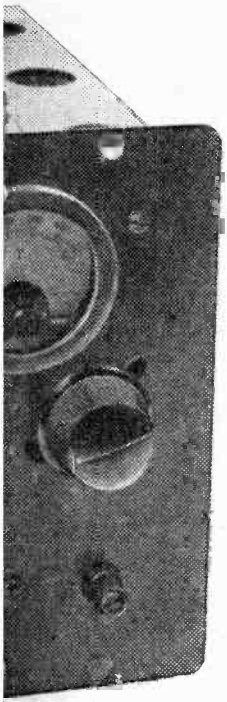
The external leads were of quarter-inch coax, about 2ft. long, with coax plug at one end. R14 was fitted inside a discarded bakelite shaving-soap holder, and the probe was made of a length of threaded rod, three or four inches long, mounted on the base of the holder. This was filed to a point and a length of tightly-fitting sleeving slipped over it.

LIST OF

C1—0.0001 μF 2,500 v.w.
C2—0.001 μF.
C3} 16 μF electrolytics.
C4}
CR—Germanium diode.
MR—Selenium rectifier replacement type for mains portables.
T1—Mains transformer. Instrument type.
S1—Single-pole seven-way ceramic switch.
S2—Two-pole two-way switch Yaxley type.

VR
VR
2—
3—
M—
R1
R2
R3
R4
R5
R6
R7
R8
R9

For the R.F. probe, an aluminium case was found, identical in shape and size to the shaving soap case, and with a screw-on lid. A probe was similarly fitted to the lid of this, but insulating washers were necessary to isolate the probe from the case, which is at earth potential. The rest of the components in the probe circuit were neatly wired and folded together, and the body of the case, with a lining of insulating material inside, and a hole drilled in base to take the coax, was passed over the coax lead and screwed up tight, a coax plug being fitted at the other end of lead.



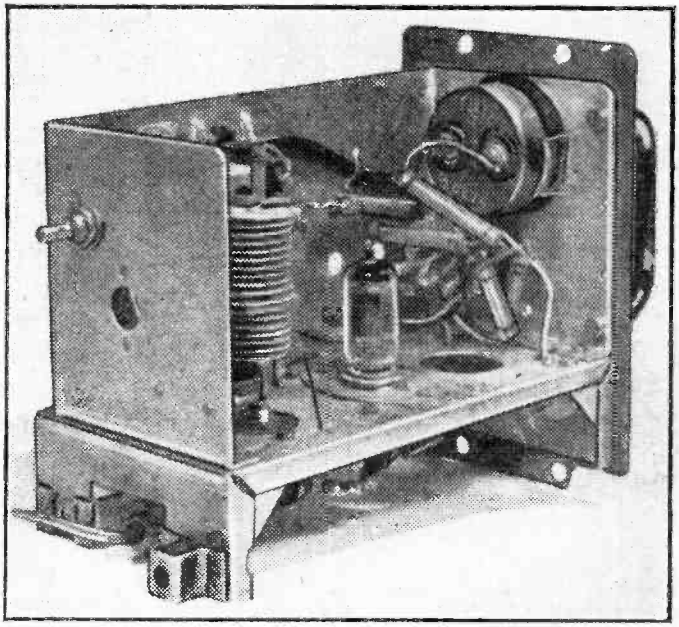
layout.

Calibration

To calibrate the instrument, allow it to warm up for fifteen minutes or so, then short-circuit the tip of the D.C. probe to chassis, and with S2 in the D.C. position, adjust R1 for zero deflection on the meter. Remove the tip of probe from the chassis and place probe across a 1.5 volt cell, which should preferably be a new cell, and adjust VR2 for full scale reading on meter, with S1 in the 1.5 volt position (position 1). Reverse S2 and 1.5 volt cell and check for negative readings with probe. A considerable difference between positive and negative readings of the cell will indicate out of balance between the two triodes and a change of valve could be tried.

The cover of the unit can now be replaced, first drilling a hole in the rear of it to clear the locknut and spindle of S2. A knob can be fitted to S2 after cover has been replaced.

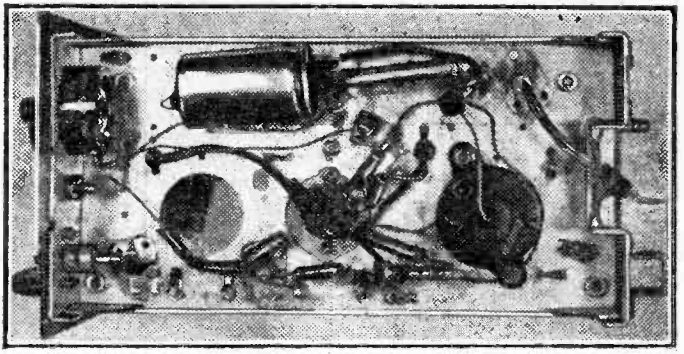
It was found that when the probe was placed in contact with certain parts of equipment, the meter pointer vibrated rather heavily against the back stop, though S2 was in correct position. It was discovered that this happened when the earth connection was omitted from voltmeter chassis. Connecting earth completely stopped this. It could be an advantage to use a three-core flex cable for mains connection, with three-pin plug, and *make sure* that all three-pin sockets have their earth sockets well and truly earthed; this should be a *must* in all shacks, in any case!



General view of the chassis.

Using the Meter

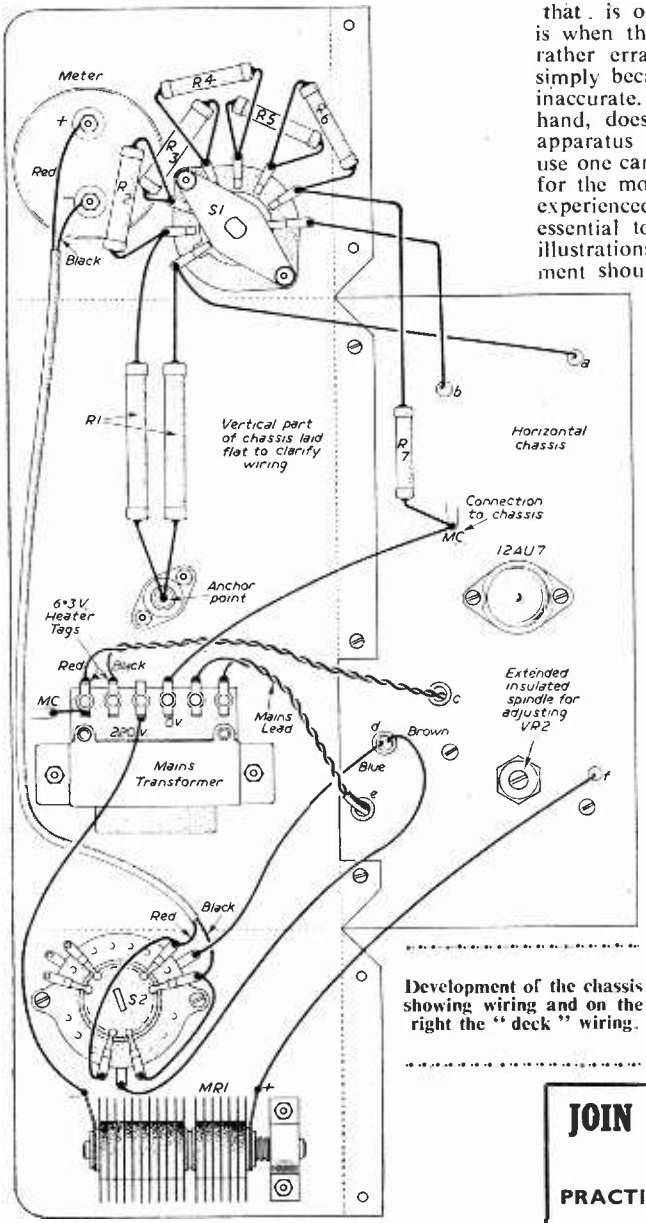
In case there are any readers who are uncertain as to the reason for using a valve type of



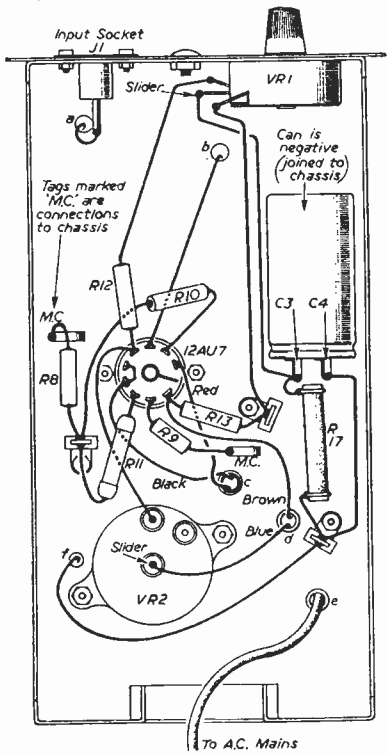
Underside view of the "deck."

PARTS

-10K potentiometer small type (see Text).
-25K potentiometer.
lve adaptor plates.
iobs.
00 μA meter.
0 megohms, 1 watt — R10, R11 — 100 ohms.
megohms, 1 watt — R12, R13 — 22 K.
megohm, 1 watt — R14 — 1 megohm.
00 K. — R15 — 68 K.
0 K. — R16 — 1 megohm.
3 K. — R17 — 3.6 K.
K.
megohm.



Development of the chassis showing wiring and on the right the "deck" wiring.



that is obtained will actually be lower than it is when the test meter is removed. Thus some rather erratic faults may be difficult to locate, simply because the voltage readings obtained are inaccurate. The valve voltmeter, on the other hand, does not consume any current from the apparatus to which it is connected and by its use one can, therefore, locate some of the reasons for the more mysterious types of fault which are experienced in television receivers. It is not essential to use the RF26 cabinet shown in the illustrations, but if it is not employed the instrument should be housed in a metal case of some kind so that it is completely screened and free from extraneous influences.

voltmeter, it may be stated that the ordinary simple type of instrument usually employed by the amateur is definitely unsuitable for certain voltage measurements, either in a television receiver or in an ordinary radio set. To put it in simple words, a standard type of meter takes current, and therefore if it is connected across some part of a circuit where an extremely low current is flowing, the additional current taken by the meter will result in a voltage drop across the circuit as a result of which the reading

Scanning & Synchronisation

5.—LINE SCANNING CIRCUITS (1)

By G. K. Fairfield

LINE scanning systems used for deflecting 53 deg. scanning-angle tubes at relatively low E.H.T. potentials could afford to be quite inefficient and so wasteful of scanning power were they that they have become known as "Brute Force" methods. An E to I conversion stage was used in which the energy stored in the magnetic field at the end of the scan was dissipated in large-wattage resistors connected across the scanning coil. This was necessary to prevent resonances from being set up in the scanning coils and distorting the scanning waveform. It was shown in the first of this series that this could lead to very large current demands

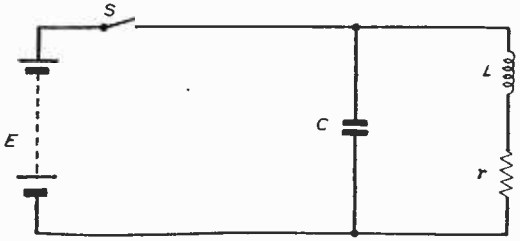


Fig. 30.—Efficiency-diode scanning. Simple equivalent circuit.

when used for wide-angle tubes at large E.H.T. potentials.

The efficiency-diode scanning circuit is inherently more efficient by conserving, instead of dissipating, the stored energy.

Theory of Efficiency-diode Action

The best way to understand this circuit is to get down to fundamentals and consider the simple equivalent circuit of Fig. 30. Here the inductance L, represents the scanning coils and C the stray and self capacitance associated with these coils. The resistance of the coils is shown as r. Consider the sequence of events when the switch S is closed. Current I will flow through Lr and increase exponentially, at a rate governed by the L/r time-constant. As mentioned earlier, if the rise is only a small fraction of the maximum current I max = E/r then it can be considered as a linear increase of current with time. After a short interval t1 (see Fig. 31) the switch is opened and this current rise ceases, after reaching a maximum value +I amps (small compared with I max.). Energy has, however, been stored in the inductance L and causes current to flow out of L into the capacitance C during time t2. The direction of current through L has now been reversed and when it has reached a value of −I amps., then switch S is closed once more. The charge acquired by C during time t2 is now used to charge the battery E, whilst the current in L gradually reduces to zero during a time t3, again with a time-constant L/r.

Now if no losses are present in the circuit (i.e., r = 0Ω) then the charge lost by the battery during t1 is put back into it during t3 and a linear rise of current in L obtained in the process. In a practical circuit the switch is replaced by two valves, one of which (a pentode V1) conducts during the period t1, and the other (a diode V2) conducting during period t3 (Fig. 32). It will be noticed that a capacitor C1 has been added to the circuit. This will be in series with V2 during its conduction period and will receive the charge shown going to the battery in Fig. 30. The potential developed across C1 (the boost volts Eb) will be added to the H.T. and provide V1 with a bigger supply potential.

This simplified circuit is given practical form in Fig. 35 which is a typical efficiency-diode circuit, with a controlling sawtooth potential applied to V1, the amplitude of which is such that this valve conducts only during period t1. The transformer T performs the dual function of matching both the diode and pentode impedances to that of the scanning coils during their respective conduction periods.

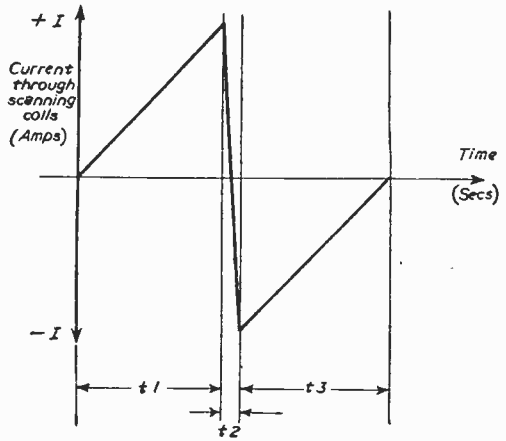


Fig. 31.—Variation of current through L with time.

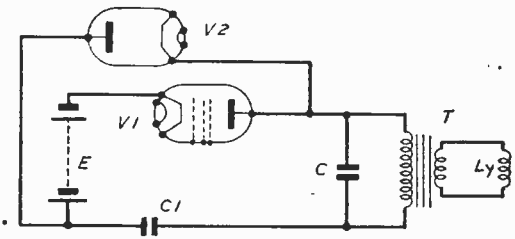


Fig. 32.—Switch S of Fig. 30 replaced by two valves.

Transformer Design and Construction

This is the most important single item in the circuit of Fig. 35 and has several rather special features which render its construction different from, say, a frame output transformer. These can be summarised as problems of bandwidth, potential gradient. and coupling factor.

A transformer handling a sawtooth of repetition frequency 10 kC/s must be capable of passing. without relative attenuation, frequencies up to at least 100 kC/s; consequently the transformer core losses assume some importance. As the circuit can be loosely considered as a push-pull arrangement there is less risk of core saturation by a constant D.C. through the windings and the use of nickel-iron alloys, e.g., radiometal,

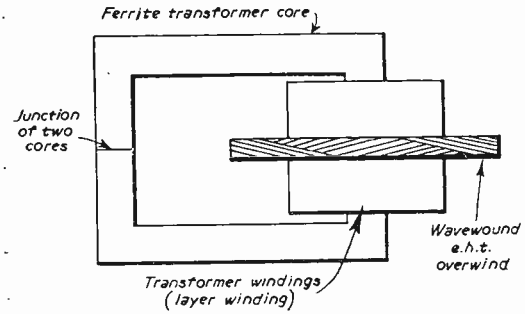


Fig. 34.—Auto-transformer constructional method to obtain a good potential gradient.

rhometal. mumetal. etc., is permissible. However. due to the low losses at high frequencies and the high permeability of ferrite materials. these have now replaced metal stampings for line transformer service. Now that these materials are becoming available to the amateur constructor it is proposed to limit the design details given in this series to their use.

It was mentioned in the first article of this series how a large pulse voltage is developed across the deflection coils during the retrace period. This voltage is stepped-up by transformer action to some 4 to 7 kV at the pentode anode connection. Naturally this leads to special valve construction and. of course, good transformer insulation. By winding an additional coil over the transformer shown in Fig. 35 this pulse voltage can be further increased until 10 to 20 kV is available, and which. after rectification can be used as E.H.T. for the cathode-ray tube. The secret of success with transformer construction of this nature is to ensure a constant potential gradient across the winding and a low self-capacity for the E.H.T. winding. This had led to the type of construction shown in Fig. 34. Here a pair of U-shaped ferrite cores are used and the transformer windings wound on one limb. commencing with the deflection coil winding. A narrow wavewound coil is placed over this and serves to increase the E.H.T. pulse to the required amplitude. By winding the coil in this manner the large number of turns required can be obtained without unduly increasing the self-capacitance. Going outwards from the innermost windings the peak potential will thus be seen to increase gradually until a maximum is reached at the outer connection of the E.H.T. winding. A good potential gradient is consequently obtained at mimimum breakdown risk.

A practical application of the theory and trans- efficiency of the transformer if maximum scanning current is to be transferred to the deflection coils. A high coupling factor is necessary between the winding matching diode and pentode to the coils. Fortunately this is easily assured by the auto-transformer connections shown in Fig. 35. and also by high permeability of the core material. and using Mullard ferrite known under the trade

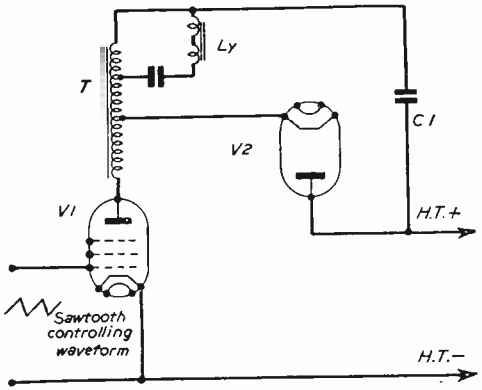


Fig. 35.—Practical efficiency-diode circuit.

name of "ferroxcube," coupling factors of over 0.99 are obtainable.

A practical application of the theory and transformer construction discussed in this article will be given next month in the description of a complete line scanning circuit. when methods of linearization and scan width variation will also be described.

(To be continued)

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.

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A.C. 4-Valve Superhet, complete with valves, but less scale and pointer, unused. 39/6 plus 3.6 post & insurance.

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.

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

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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, 11 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 4/6.

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.

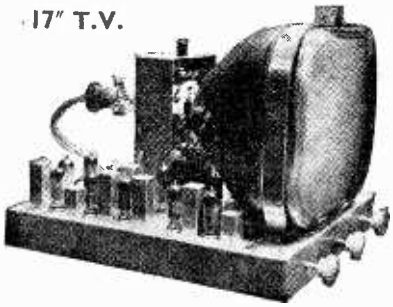
NOTE: Orders for small components over £2 are post free, otherwise please add sufficient.

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.) Price only 19/6, plus 2/6 post and insurance. Data free with parts or available separately 1/6.

BUILD THIS IN AN EVENING

17" T.V.



Undoubtedly the most up-to-date televisor for the home constructor. You can build it in an evening and the set when finished will be equal to a factory-made equivalent. What other constructor T.V. has all these features?

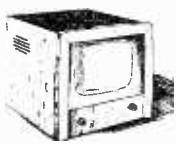
★ No technical knowledge required.
★ All miniature valves.
★ Metal rectifier.
★ Turret Tuner.
★ 12-channel circuitry.
★ Multi-vibrator time bases.
★ Ferruxcube, E.H.T. and scan coils.
★ 34.38 Mc/s I.F.
★ Suitable for any modern 12, 14 or 17" tube.

The building cost (less tube) is only **£29 10 0**, plus 10/- carriage and insurance, or £15 deposit & 12 monthly payments of 27/-. All parts guaranteed 12 months. **Full information and data, price 3/6.**

MAINS ISOLATION TRANSFORMER

Makes servicing safe, also makes the adjustment for differences in mains voltages very simple. Input tapped 200-250 v., output tapped 200-250 v. Continuously rated at 500 watts, intermittent rating 2,000 watts. Cable entry by terminal blocks, two separate screens for suppressing mains interference. Size approximately 14 in. x 6 in. x 8 in., weight approximately 40 lbs. Price £5/12.6. Carriage and insurance 7/6 (up to 250 miles).

14" T.V. CABINET



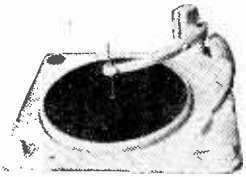
14in. T.V. cabinet of the latest styling made for one of our most famous firms—beautifully veneered and polished—limited quantity—19/6 each. Carriage and packing 3/6 extra.

THIS MONTH'S SNIP

INDICATOR No. 9S

Contains many hundreds of very valuable spares including no less than 12 potentiometers. This indicator unit will take the VCR97 or the VCR517 and with relatively simple modifications can be turned into an Oscilloscope. Limited quantity offered at the extremely low price of 10/- each, carriage and packing 4/6 up to 250 miles, beyond this distance at cost.

Yours for £1.10.0 Down



The latest most up-to-date Record Player made by the famous B.S.R. company. Using Hi-Fi Crystal Pick Up and fitted with every modern device. Definitely a record changer which will give years of trouble-free music. Not surplus but the current model. Price £9/10/- or £1/10/- deposit and 8 monthly payments of £1, carriage and insurance 5/-.

FLUORESCENT LIGHTS

These are complete fluorescent lighting fittings. Built-in ballast and starters—stove enamelled white and ready to work. Ideal for the kitchen, over the work-bench and in similar locations.

Single 40. 4 ft. 3 in. long, uses a 40 watt tube.

Twin 20. Uses 2 20-watt standard tubes.

Price for either type 39/6, with tubes.

Carriage and ins. up to 150 miles 5/6, up to 250 miles 7/6.

SPEAKER BARGAIN

12in. Hi-fidelity loudspeaker. High Flux. Permanent magnet type with standard 3 Ohm speech coil. Will handle up to 12 watts. Brand new by famous maker. Price 32/6, plus 3/6 post and insurance.

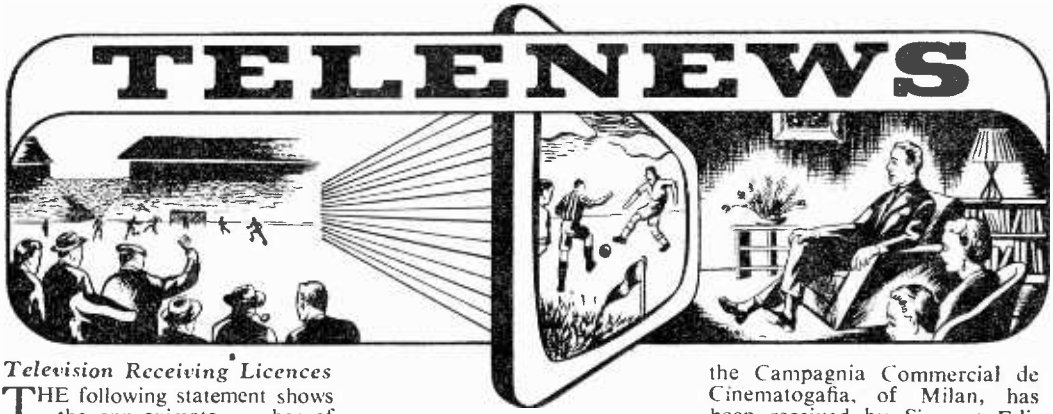
CAR STARTER CHARGER KIT

All parts to build 6- and 12-volt charger which can be connected to a "flat" battery and will enable the car to be started instantly. Kit comprising the following:

Mains transformer	22/6
5-amp. rectifier	17/6
Regulator Stud Switch	3/6
Resistance Wire	2/-
Resistance Former	2/6
Mains on/off Switch	2/6
0-5 amp. Moving Coil Meter	12/6
Construction Data	1/6

or if bought all together price is 52/6, plus 3/6 post and packing.

Waterproof P.V.C. covered Heating Element, 16 ohms per foot. 1/- per yard.



Television Receiving Licences

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

Region	*Total*
London Postal	1,529,083
Home Counties	908,227
Midland	1,229,644
North Eastern	1,195,137
North Western	1,063,766
South Western	562,096
Wales and Border Counties ...	422,734
Total England and Wales ...	6,910,687
Scotland	540,786
Northern Ireland	72,598
Grand Total	7,524,071

Marconi Activities in South America

DESPITE the keenly contested nature of the Latin-American electronics market, Marconi's are having considerable success in this field. Recent orders from Venezuela include one for a complete Band III television station and one for a medium-frequency sound broadcasting transmitter.

The television station, which has been purchased by Radio Valencia, comprises a 2kW vision transmitter Type BD. 357A, a 1kW sound transmitter Type BD.305, programme input equipment, a quadrant aerial array, a vidicon telecine unit, vision and sound links, a 3-camera outside broadcasting unit and studio lighting equipment.

B.I.R.E. Award to Cossor Director

THE British Institution of Radio Engineers has announced the award of the 1956 Brabazon premium for the most outstanding contribution on radio and electronic devices for aircraft safety to Mr. K. E. Harris, Technical Director of Cossor Radar & Electronics Limited, for his paper, "Some problems of secondary surveillance radar systems."

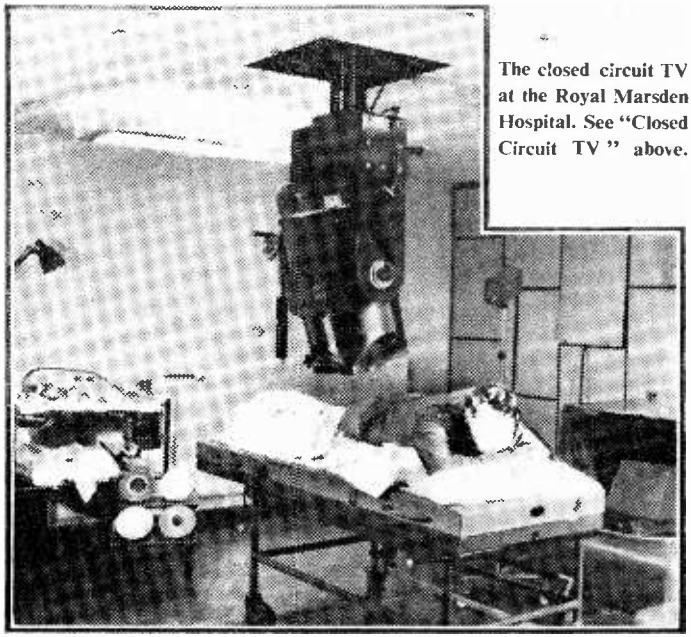
This is the second such award in three years as the 1954 Brabazon premium was given for a paper on "A high definition general-purpose radar" by four Cossor engineers. Messrs. Jenkins, Evans, Chambers and Wallace.

£10,000 Worth of Ediswan Tubes for Italy

AN order value £10.000 for Ediswan 21in. rectangular television cathode ray tubes for the Campagnia Commercial de Cinematogafia, of Milan, has been received by Siemens Edison Swan Ltd. These tubes are being sent to Italy for incorporation in television receiver chassis made by Messrs. E. K. Cole, Ltd., which will be housed in cabinets of Italian manufacture.

Closed-circuit Television Aids Radiation Treatment

MARCONI closed-circuit television is being used in a London hospital to assist in the deep therapy radiation treatment of patients. The equipment is used in conjuction with a Telecaesium Ray Treatment unit at the Royal Marsden Hospital, and permits the treatment to be car-

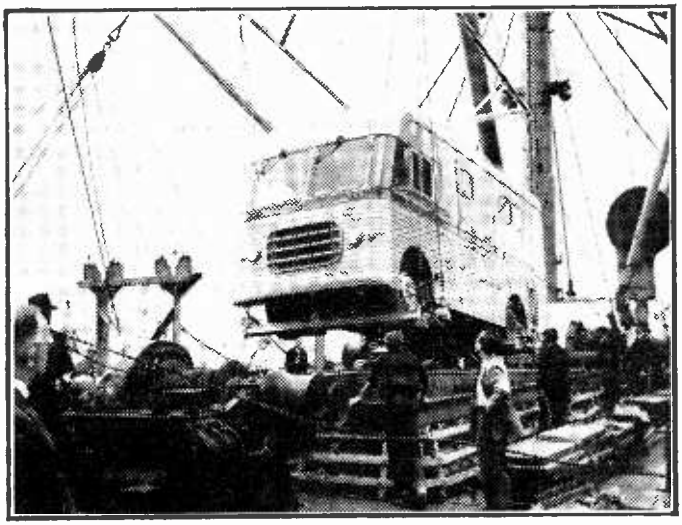


The closed circuit TV at the Royal Marsden Hospital. See "Closed Circuit TV" above.

ried out by remote observation. In this way doctors and radiographers are safeguarded against excess radiation, which can produce harmful effects.

Observation of the patient is necessary during this type of treatment since a beam of gamma rays is accurately directed into the affected region. It is therefore important that this region be kept in a fixed position relative to the beam, since a centimetre's movement in any direction would render the treatment useless.

By keeping the patient under constant supervision during the irradiation treatment any movement is immediately observed. The treatment is then discontinued while the patient is repositioned. In this way the specialist knows that the equipment is being used at maximum efficiency and in the most economical manner.



A Marconi TV van being shipped to Venezuela. See page 281.

New TV Transmitter in Hungary

BUDAPEST'S television station plans to go over to its new 30 kilowatt transmitter by the middle of this month. The television station stands on Liberty Hill overlooking the capital.

The transmitter, bought from East Germany, was due to go into service in April of this year, but plans were delayed.

The transmitter is to send out experimental programmes up to January 1st. "Naturally, we cannot ask for money for these programmes, but when regular programmes commence television licences will have to be paid for in the same way as radio licences." Mr. Kövesi, deputy managing director of the Hungarian Post Office, said.

Plans have been made for a TV hook-up and exchange of programmes with Bratislava in the first half of next year. Four "bouncer" stations will be built to relay the transmissions.

I.T.V. in the North East

THE Independent Television Authority has invited applications for the contract to provide television programmes for its transmissions in the North East of England.

The Authority's station will be built at Burnhope, about five miles south-east of Consett. It is hoped to open the service late next year.

The coverage of the station is predicted as a rough crescent running from Alnwick in the north, through Middleton in Teesdale in the east, and nearly to Whitby in the south. The highly concentrated populations of Newcastle, Sunderland, Middlesbrough and South Shields will all lie well within the service area. The Burnhope station will have an effective radiated power of about 100 kilowatts and a 750ft. mast will be used.

This will be the eighth transmitting station on the Authority's network. It will bring another 2,500,000 people within reach of independent television, making a total, including those that will by then be served from the St. Hilary and Chillerton Down stations, of over 43 millions—a coverage of about 85 per cent. of the total population of the United Kingdom.

New Scottish TV Weather Service

A NEW TV weather service for Scottish viewers will be in operation this winter. By agreement with Scottish Television Ltd., the Automobile Association will provide special charts showing prevailing road conditions whenever snow, ice, fog or floods affect roads in Scotland.

Up-to-the-minute reports of road conditions, received by radio and telephone from A.A. patrols covering important roads throughout Scotland, will be collated in the operations room of the A.A. headquarters in Glasgow, and specially drawn charts prepared for showing in the S.T.V. news at 1.30 p.m. and 6.40 p.m.

The object of the charts is to give a general indication of the state of the roads to intending travellers. More detailed information can be obtained from A.A. offices.

America Receives BBC TV

BBC television direct from London has been received for the first time on several succesive days in New York—a distance of over 3,000 miles.

The pictures, seen on a standard British receiver, included the David Nixon show "It's Magic," and were picked up at the Baldwin, Long Island, receiving station of Press Wireless, Inc. First reception was on November 1st, and later reports said that pictures had been received on six occasions in seven days.

This is the first time that such pictures have been seen since 1937, when American TV engineers briefly received a picture.

TELEVISION TUBES

12 MONTHS' GUARANTEE

17" £7.10.0 14" £5.10.0

RECTANGULAR T.V. TUBES

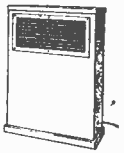
6 months full replacement. 6 months progressive. Made possible by the high quality of our tubes. Terms or Cash. 15/6 Ins. Carr. **CONVERT YOUR 9in., 10in., 12in. to 14in., 15in., 16in.** Our pamphlet is FREE and on many sets costs only the tube to give you these giant pictures.

SPECIAL OFFER. 14in., 15in., 16in. T.V. Tubes **£5.** Perfect, see them working. 3 months guarantee. Ins. carr. 15/6.

12in. T.V. TUBES, £6. 3 months guarantee. Ins. Carr. 15 6.

T.V. TUBES, 30/-. With cathode to heater shorts. 15/- with burns. State type and size required.

ELECTRIC CONVECTOR HEATER, 99/6. Cleaner, cheaper, safer than paraffin. A.C./D.C. Switched for 1 or 2 k/W. Illuminated grille. Ins. carr. 10/3.



ELECTRIC FIRES, 17/3. Hammered finish. A.C./D.C. 200 250 volt 750 watt. Post 3/3.

MIDGET EVERREADY BATRYMAX 1/9

" B " type battery. 22½ v. No. B155. Ideal for Midget or Personal Radio. Hearing Aid, or Photography Flash. Size 1in. x 2in. 1 for 1/9. Post 3d. 6 for 7/-. Post 6d. 12 for 12/-. Post 9d.

CANDELABRUM. 19/9. 3 light lounge fitting. Complete with lamp holders, flex and shades. P. & P. 2/9.

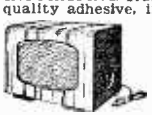
CAR AERIALS, 6/9. Whip antennae, 50in. long collapsing to 11in., one-hole fixing. Post 1/-.

TERMS AVAILABLE

HEADPHONES 1/9

HEADPHONES, 1/9. Single earphone and headband. C-LR. Ideal for crystal sets, extension on radio etc. P. & P. 1/3.

INSULATING TAPE, 1/6 (75ft. x ½in. wide) finest quality adhesive, in sealed container. Post 9d.



EXTENSION SPEAKERS, 29/9. Complete, fitted with 8in. P.M. Speaker, "W.B." or "Goodmans," of the highest quality. Standard matching to any receiver (2-5 ohms.) Flex and switch included. Unrepeatable at this price. Money refunded if not completely satisfied. Ins. carr. 3/6.

8in. P.M. SPEAKERS, 8/9. Let the lady of the house listen to that T.V. or radio programme. Complete with O.P. trans. 10/-. P. & P. 2/6.

P.M. SPEAKERS, 12/9. Elac or Goodmans. High quality, 2-5 ohms. Complete with O.P. trans., 14/-. P. & P. 2/9.

MAINS TRANSFORMERS

350-0-350 v. 80 mA. 4 v.-4 v. heaters. 200-250 v. Prim. ... 3/9
350-0-350 v. 80 mA. 12 v.-4 v. heaters. 200-250 v. Prim. ... 2/9
280-0-280 v. 80 mA. 6 v., 4 v., 4 v. 200-250 v. Prim. 5/9
Drop through type. Half shrouded. All above 2/3 post.
425-0-425 v. at 250 mA. 5 v. 6 a., 6.3 v. 12 a., 6.3 v. 6 a., 200-250 v., 17/6. Screened primary. P. & P. 2/6.

O.P. TRANSFORMERS, 1/3. Standard size (2-5 ohms). Post 1/-. 20 for £1. P. & P. on 20, 5/6.

SELF-FEED SOLDERING TOOL, 19/6. 6-12 volt, 110-125 volt. Made for the American market. Car Battery or mains, export quality. Complete in light carrying case. Reel of solder and spare parts. P. & P. 2/9. A few of the above in 6-12 volt, 200-210 volt. 35/6.

T.V. AERIALS, 25/6. For all I.T.A. and F.M. channels. For outdoor or loft. 3 elements. Famous manufacturer, At half the normal price. Post 2/6.

T.V. MASKS, 7/9. 17in. Grey plastic. Brand new. Post 2/-.

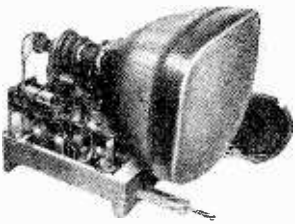
T.V. MASKS, 14/9. 17in. Halo lighting. New. 2/-.

T.V. MASKS, 10/9. 17in. White plastic. New. 2 - Postage.

5 VALVE MIDGET RADIO, 79/6. Superhet Octal valves : 12K8, 12K7, 12Q7, 35L6 & 35Z4. 5in. speaker included. 2 wave bands (L & M). 3 control knobs. 100-240 volts. Universal supply. Wooden cabinet, size 17in. x 8½in. x 6in. Ins. carr. 3/6.

TORCH LANTERNS, 6d. each. X.W.D. Includes 2 bulbs, uses 800 battery. P. & P. 1/-. Crate of 48 with 22 bulbs extra 22/-. (118 bulbs in all.) Ins. carr. 10/-.

17" T.V. CHASSIS £19.19.6

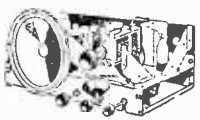


Latest improved circuits. Higher E.H.T. (brilliant picture). Improved sensitivity (for greater range). Chassis easily adapted to any cabinet. 17in. rectangular tube on adapted chassis. All channels. **Turret Tuner 50/-** extra. Less valves. With five valves **£21.19.6.** With all valves **£25.19.6.** Valve line-up (5 valves): 2 6D2, SN7G, 6P25, EL38. Others: 7 6F1s, EL38, 6L18. **12 months' guarantee** on tube, 3 months' guarantee on valves and chassis. Ins. carr. 25/- (incl. tube). State B.B.C. channel and I.T.A. if turret required.

14" T.V. CHASSIS, TUBE, SPEAKER. £13.19.6.

As above, with 14in. round tube. Less valves. Guaranteed 3 months. With 5 valves **£15.19.6.** With all valves **£19.19.6.** Turret tuner 50/- extra, ins. carr. 25/- (incl. tube).

POPULAR RADIO OR R/GRAM CHASSIS 39/6



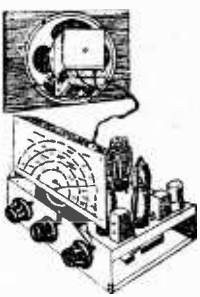
3 w/band and gram Superhet, 5-valve. International. Octal. Ideal table gram, but still giving high quality output. 4-knob control 8in. P.M. Speaker. 7/9 extra. Set of knobs, 2/-. Chassis size: 12in. x 6in. x 9in. Less valves. Ins. carr. 4/6.

12in. T.V. CHASSIS & SPEAKER, 59/6. These chassis can be adapted to take 14in., 15in. or 17in. tubes. Complete chassis by famous manufacturer. R.F. E.H.T. unit included, also 8in. P.M. Speaker. Chassis is in 3 separate units (power, s/vision and timebase inter-connected). These chassis can easily be fitted into existing console cabinets. Less valves and tube. Channels 1-2, 3-5, I.F.s 16-19.5 Mc's. Easily converted to I.T.A. channel. Ins. carr. 10/6.

DENCO RADIOGRAM CHASSIS 97/6

3 and 4 waveband turret tuned. Superhet, A.C. D.C. chassis, with 6in. or 8in. speaker. Size: 8½in. x 10in. x 12in. Valve line-up: CCH35, EF39, EBC33, CL33 and CY31. (C1C dropper). Ins. carr. 7/6.

SUPER CHASSIS 99/6



5-valve superhet chassis including an 8in. speaker. 4 control knobs (Tone, Volume, Tuning, W.C. switch); 4 waveband, with position for gram. P.U. and for extension speaker. A.C./D.C. P. & P. 5/6.

CONSTRUCTOR T.V. CHASSIS UNITS

SOUND & VISION STRIP, 19/6. S/het. 10 valve holders (EF91, etc.) Less valves. P. & P. 2/6.

TIME BASE, 7/9. Containing scanning coil, focus unit, line trans., etc. Less valves. Ins. carr. 2/6.

POWER PACK & AMPLIFIER, 19/6. O.P. stage 6V6 with O.P. trans. Smoothed H.T. 350 v. 250 mA., 6.3 v 5 a., 22 v. 3 a., 6.3 v. 4 a. 4 v. centre tapped. Less valves. Free drawing. Ins. carr. 5/6.

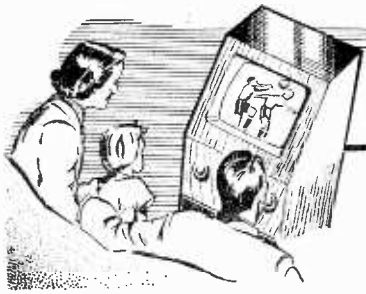
CHASSIS 1/- each, 6 or 8 valve. Latest type midget valve design for A.M. and F.M. New cadmium plated on s.w.g. steel. 12½in. x 7½in. x 2½in. P. & P. 1/6. Post on 4 3/-. 12 for 10/-. Carr. 5/-.

Boxed VALVES 3 month guarantee

1S5	4/9	77	3/9	ECC81	8/9	PP225	3/9
6AH6	7/9	210LF	3/9	EF41	8/9	PEN45	12/6
6H6M	1/9	210VPT	5/9	EL32	6/9	RL37	1/9
6N7GT	4/9	7193	3/9	KTW61	5/9	VR21	1/9
6B8G	3/9	AR6(2V)	1/9	L410	1/9	VR91	2/9
6SG7	3/9	CV183	3/9	LP220	1/9	VW49	2d.
8D2	3/9	EB34	1/9	DF66(CV210)	5/9	EF37	4/9
12BE6	6/9	ECH42	8/9	PEN220	3/9	EF37A	4/9

Liverpool St.—Manor Park Stn.—10 minutes. *Send for our FREE 1958 catalogue.* *Open all day Saturday.*

DUKE & CO. (Dept. 2), 621/3 Romford Road, Manor Park, E.12. *Tel.: ILFord 6001-3*



UNDERNEATH THE DIPOLE

TELEVISION PICK-UPS AND REFLECTIONS

By Iconos

Library Shots

ALMOST every television play on BBC or I.T.A. channels has film sequences. These are essential for real exterior scenes, for montages indicating the passage of time or for linking shots specifically introduced to allow the actors to change their costumes. When the principal characters in the play figure in any of these filmed sequences, the job has to be specially filmed for that particular play. General shots without actors, such as long shots of streets, factories, sunsets or rough seas, are used again and again in different plays, selected from the rapidly growing collections of "stock shots" held in the film library vaults of the BBC, the I.T.A. (including the I.T.-News) and the old established film companies. Some idea of the rapid expansion in this field is shown by the large stocks now held by the BBC Film Library, which have grown from one vault and a staff of two in 1948 (when the Television Newsreel started) to 60 vaults and a staff of 14 in 1957. Many historic tele-recordings are stored here, including such items as Oxford sinking in the 1951 Boat Race, Bannister's first four-minute mile, numerous public speeches by Sir Winston Churchill, and Sir Anthony Eden's Suez broadcast. Both the historic tele-recordings and the general stock shots are all carefully indexed and documented, in many cases having single sample film frames readily accessible in card index cabinets, so that television play producers can select their film sequence shots with the minimum of delay. There is a considerable amount of exchanges of library shots between the different organisations, facilitated by standardised ordering procedures, fixed search fees and agreed royalties for using the shots. An important branch is that dealing with back-projection shots, such as moving views from trains or cars, rough sea shots and the like. All the earliest films, made using the highly inflammable nitrate film base, have had to be duplicated on to modern safety film stock. Sound film and tape library, built up over many years of sound radio, has also expanded considerably. The use of ¼in. tape helps the problem of storage.

Such is the accuracy required in the floor level of a modern television studio that tests, such as this picture shows, must be made before the floor can be declared "ready for action." A slide projector, mounted on a mobile pedestal, casts a beam of light on to a line drawn round the walls of the studio at a standard height from the ground, and the light should remain on this line as the pedestal is tracked round the studio.

Advertising Space

THE tide has certainly turned for the I.T.A. programme contractors. Once there was a time when it appeared to be difficult for the authority to find "takers," and one or two of the pioneer major companies "obliged" by accepting the responsibility of providing programmes for more than one area. Now, with success assured and advertising space for commercials sold for months ahead, there is a rush for securing the concessions for the smaller and less important areas remaining.

North Eastern Area I.T.A.

THE North Eastern I.T.A. station, with studio premises to be based on Newcastle, is the battleground of many contestants for the N.E. area commercial programmes. Applications have been received from several newspaper interests, including the *News Chronicle*, the *Manchester Guardian*, *Reynolds News* and *The Scotsman*. Let us hope that the launching of the Newcastle area I.T.A. station will be a little more smooth than has been the fate of the T.W.W. station at Cardiff. Major difficulties with the

aerial system at the St. Hilary transmitter has delayed the opening of this station from 17th December until some time in January or February. Naturally, there has been much local gnashing of teeth and people have been asking who would make up the consequential loss.

Teething Troubles

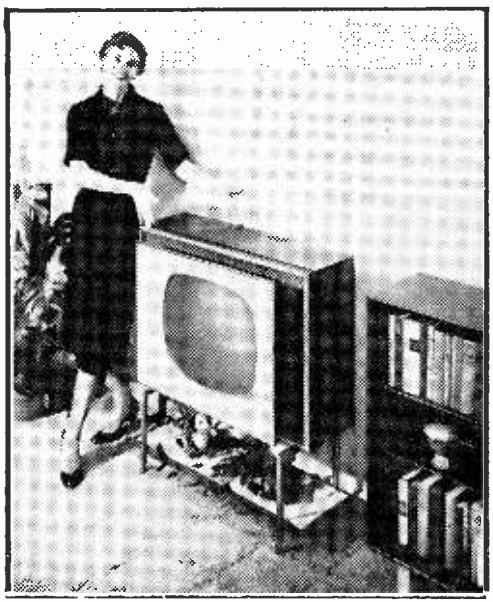
PERSONALLY, I think that the I.T.A. Engineering Department, under Mr. P. A. T. Bevan, has done a first-class and speedy job to date, and a hitch of the type that has happened at Cardiff was bound to occur sooner or later. After all, there are precedents for last-moment panics with aerial systems! Years ago, when the BBC changed their 2ZY broadcast transmitter from the Metro-Vickers works at Old Trafford, Manchester, to a warehouse in the centre of the city, radiation from the new site with triple the power was less than from the original experimental station. Bad earthing system, due to the subsoil, was the principal difficulty, and a counterpoise earth had to be hurriedly rigged. The same thing happened at Edinburgh, where the relay station transmitter was located in the University buildings—on rock. At Swansea the mast blew down. But somehow or another each of these BBC transmitters were got going on time with improvised rigs. Captain Eckersley, BBC's then chief engineer, upheld the showman's motto: "The show must go on." It is very much more difficult, however, with transmitting aerials on the commercial television channels. Pressing ahead with all possible speed, someone on I.T.A. had not allowed enough leeway for coping with hidden snags. The T.W.W. programme company can at least console itself with the fact that they have already sold 75 per cent. to 80 per cent. of their advertising time for the first twelve months of operation—which is more than could be said for Rediffusion and A-TV when they first started.

Expansion

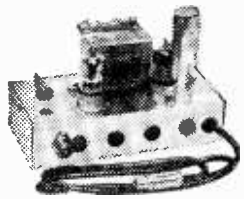
WITH a huge revenue now assured, both Rediffusion and A-TV are now considering various forms of expansion in London: in premises, in equipment, in star values and in ideas. I have heard that very large and valuable sites are being considered by A-TV, whose present technical headquarters is little better than a compact telephone exchange in Foley Street. More filmed programmes are under consideration—either filmed direct or by telerecording—with the object of increasing the sale of programme material to television stations in the Commonwealth and abroad. What will happen when another channel is to be operated in the London area by the BBC or I.T.A.? That will start a veritable gold-rush of would-be programme contractors for the I.T.A. second London area channel concession if that ever materialises. It would also probably result in a general lowering of programme standards to the most puerile levels. This, I am told, is the way to attract the mass television audience!

I.O.W.

THE South Coast I.T.A. transmitter on the Isle of Wight, with a mast at Chillerton Down shared with the BBC, will have programmes provided by Southern Television Ltd., the capital of which was subscribed in equal proportions by the Rank Organisation, the Amalgamated Press and Associated Newspapers Ltd. The headquarters will be in Southampton, where the main studios will be built or converted from existing premises. Little else is known yet of the intentions of Southern Television, but it is not difficult to make a few forecasts. Southampton is a fine progressive town, but it does not rank very high in its support of the live theatre or music. Therefore, apart from the nationally networked I.T.A. programmes, unless talent is systematically imported into the town for the local programmes—and for the rehearsals—there will have to be a high proportion of outside broadcasts from the nearest main entertainment centres, Bournemouth, Brighton and London. I would have thought it would be worth while to establish branch studios at Brighton, which could be as important to Southern Television as Blackpool is to ABC-TV, Granada and the BBC. The fame of the Municipal Orchestra at Bournemouth and the Southern Philharmonic Orchestra at Brighton could be enhanced. The latter orchestra is particularly in need of support since the Arts Council decided to support visiting orchestras only. The first-class repertory companies at Worthing, Bognor and Eastbourne should also be able to provide good television material for the programmes to be put out from the I.O.W. transmitter.



The latest from U.S.A.—the Sylvania Sylouette, a 21in. television console, has a cabinet depth of only 10in. "Floating picture" concept, with picture tube and Halo Light mask extending out 4in. from cabinet, gives a third dimensional effect to the design. The control panel is concealed beneath the top section of the cabinet which slides back for channel selection through "Magic Touch" tuning.



BAND 3 T/V CONVERTER
185 Mc/s—199 Mc/s

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 SG3s or LF80s. 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 0db-30db, 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 to 10 megohms.

CARBON		WIRE WOUND	
20% Type, ½ w., 3d.; ½ w., 5d.; 1 w., 6d.; 2 w., 9d.	5w.	25 ohms—1/3	
	10w.	10,000 ohms	1/6
	15w.	2	
10% Type, ½ w., 9d.; 5% Type, ½ w., 1/-; 1% Hi-Stab., ½ w., 2/-.	5w.	15,000— 33,000 ohms	1/9 2/3
	10w.		

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

SPEAKER FRET.—Expanded Bronze anodised metal 8 x 8in., 2/3; 12 x 8in., 3/-; 12 x 12in., 4/6; 12 x 16in., 6/-; 24 x 12in., 9/-, etc.

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

80 ohm CABLE COAX

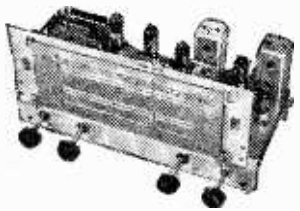
STANDARD ¼in. diam. Polythene insulated. GRADE "A" ONLY.

8d. yd.

SPECIAL — Semi-air spaced polythene, 80 ohm. **Coax.** ¼in. diam. Stranded core. Losses cut 50%. Ideal Band 3. **9d. yd.**

8" P.M. SPEAKER (3 ohms)

Ex Mfrs. 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. 9VA
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, 13½ 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—LATEST MODELS.

4 Speed BSR (Model T.U.9), 99/6.
4 Speed COLLARO (Junior), 5 gns.
4 Speed GARRARD (4SA/P). £7.10.0.
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4 speed BSR (Model UA8). £8.15.0.
4 speed COLLARO (RC456, etc.). £9.15.0.
4 speed GARRARD (RC4 120H), 9½ gns.
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All above models Brand New and Guar. Fitted latest style Tweight Xtal. P.U. with turnover head and twin sapphire stylii.

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.

SCOTCH BOY, EMITAPE, etc., 1,200ft., 27/-. Long playing, 1,800ft. reels, 45/-. Paper tape, good quality, 1,200ft., **12/6.** Reels only, 3in., 3/-; 5in. 3/8; 5½in., 4/-; 7in., 4/3.

I.F. TRANSFORMER—465 kc/s.

Brand new ex-manufacturer's midget I.F.T. size 2½in. x 1in. x 1in. 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. 515 pf. to 5,000 pf., 2/-.

SPEAKERS.—PM 3 ohm, 2½ in. Elac., 16/6; 3½in. 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
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6AT6	8/6	35L6	10/6	EF91	8/6
6K7	6/6	EABC80	9/6	EL41	10/6
6K8	8/6	EB91	6/6	EL84	11/6
6Q7	8/6	EBC41	10/6	EY51	10/6
6SN7	8/6	EBC83	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	PCF84	10/6
7/6	9/-	ECH42	10/6	PCF80	10/6
7Y4	8/6	ECH81	10/6	PCF82	10/6

PCL83	12/6	PL82	10/-	U22	8/6
PL83	11/6	PY80	9/6	U25	11/6
PY81	9/6	PY82	8/6	UBC41	9/6
PY83	10/6	UCH42	10/6	UCH81	10/-
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SPECIAL PRICE PER SET

1R5, 1T4, 1S5, 1S4 or 3S4 or 3V4 ... ... 27/6
DK96, DF96, DAF96, DL96 ... ... 35/-
6K8, 6K7, 6Q7, 6V6, 5Z4 or 6X5 ... ... 35/-

ELECTROLYTICS ALL TYPES NEW STOCK

Tubular Wire Ends		Can. Type, 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/-
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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.	8/6
16 500 v. Dub.	4/-	50 350 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.	11/6
32 500 v. Dub.	5/-	60+250 275 v.	12/6
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.	3/6

TRANSISTOR.—Midget electrolytics, 2 mfd. 4 mfd., 8 mfd., 6 v., 3/6. 6 mfd., 10 mfd., 16 mfd., 3 v., 3/6. 32 mfd., 1½ 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; K3/1008 kV., 13/6, 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. sec. 5 v. or 6.3 v. 1 a. rect. 6.3 v. 2.5 a. set Hts., 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; 13.3. v., 10/6. Ditto with mains primaries 200 250 v., 12/6.

SPECIAL TRANS.—Wound to your requirements.

TRANSISTORS

Mfr'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, 1½in., 50 ohm, 3/9.

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 WARNING

SIR,—I should like to recount an experience of mine which I hope will serve as a warning to others. I had a set given to me for servicing and I removed it as far as it would come from the cabinet. It was so constructed that it would not come right out. I then made some checks with a voltmeter/ohm-meter, and at one point found a very low reading. Checking back to the service sheet showed that the reading should have been much higher, so I located a resistor at that point, unsoldered it, replaced it with one which came from my "good spares box" and again made a check. To my surprise the same original reading was obtained. I traced through the wiring and there were no shorts or leaks apparent, and after disconnecting each end of the complete circuit wire at this point I put both prods of the test-meter across the ends and everything was as it should be. Soldering one end of the circuit back I made another check and everything was all right. I then connected the remaining end and made a check as at first, and everything was again all right. I sat and thought over this and it suddenly dawned on me what had happened. Owing to the rather awkward part in the chassis where the test was being made I was using one probe on the actual component or wiring, one clipped to the chassis and my other hand was supporting the chassis. The lead clipped on to the chassis was making a poor connection due to dirt and corrosion, and the actual test-meter circuit was being completed through my body, as I was holding the test probe. I repeated the "fault" several times to make sure of this, and my warning is: make sure the clip of such a tester is in good contact with the chassis or "earthy" side by making use of a soldered contact somewhere in the wiring, and *do not touch the chassis*, even though the set may not be connected to the mains.—G. H. TERRENT (N.4).

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.

DABBLERS

SIR,—Having read the various letters on "dabblers" and "anti-dabblers" in your correspondence columns, I should like to quote you an incident that happened to me.

Some seven months ago an acquaintance of mine purchased a secondhand TV set, quite cheap, and took it to a dealer for an overhaul and to have it converted to Rediffusion (wired TV). The dealer informed the owner that it needed new smoothing condensers, a sync separator valve and a frame amplifier valve. He also told him he'd tried the set both on aerial and Rediffusion input and that it received a perfect picture on BBC, but was no good on I.T.A., and that a new tube was required to get I.T.A. The owner thought that having got so far he might as well have the new tube—another £18. The set was duly delivered and installed. At the top of the picture was a black line about 1¼in. down from the top of the mask. The dealer said this couldn't be removed because there was a fillet in the top corner of the cabinet and that he couldn't get the tube up enough without removing the fillet. The line hold was very critical and the dealer put this down to the fact that it was an old set (my estimation 4-5 years), and that he couldn't do any more. The owner took it for granted and paid up. Over £30 altogether for tube and conversion. All this time he has endured a picture of which he could never see the bottom and which was constantly breaking up.

Then he asked me if I would look at it, knowing that I had built my own set and I knew a little bit about them. I found a faulty coupling condenser from sync to line oscillator which cleared the line hold trouble. The picture height control I set correctly and shifted the focus magnet, which removed the black line and brought the picture up to its proper position. I also found four valves had been removed from the now inoperative vision unit. The owner couldn't thank me enough, and says now it's a treat to watch a decent programme.

This may sound fantastic to you, as it did to me when the owner told me, but I can assure you it is absolutely true. I am only an amateur, but I think it's a disgrace the way some of these so-called professionals prey on the innocent public. —"CONTRAST" (Name and address supplied.)

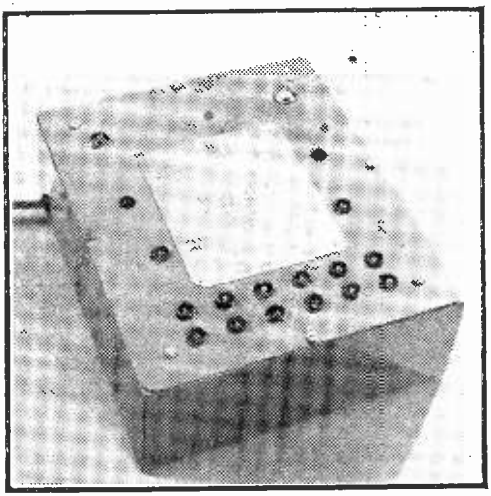
AERIAL DESIGN

SIR,—I am a service engineer and have been surprised at some of the misconceptions which exist as to aerial design. A simple dipole for television is dimensioned to be resonant at about 1.5 Mc/s below the vision carrier frequency. This is done so that the television signal will be spread evenly on either side of resonance. When, however, additional elements are added to the aerial this band width decreases. With an H-type dipole it will not decrease sufficiently to be noticeable, but with multi-element arrays it can be serious. In fringe areas this has, unfortunately, to be tolerated, as picture resolution is the most important point. In other areas, therefore, it is best not to use more directors on the aerial than are absolutely necessary for good picture resolution.—R. BROWN (Sidcup).

News From the Trade

New Wolsey Lines

TWO new products are announced by Wolsey Electronics and one is shown below. The first is a wide spaced, wide stacked double array aerial for long range reception. This is to be known as the "Interceptor 5" and will be available in four types. Model 360/DY5 is the double array only and costs £5 15s., whilst DY5L is the same with the inclusion of a 4ft. 6in. crank mast, and chimney lashing equipment. This costs £7 6s. 6d. Model ADY5M is the aerial with a 9ft. × 1½in. mast and BDY5M is the aerial with a 12ft. × 2in. mast, these costing £9 7s. 6d. and £11 5s. respectively.



The New Wolsey Distribution Box.

The other item is a Distribution Unit, type D.S.14. This has been designed to meet the demand for feeding multiple television units from a single aerial system. It provides 12 outlets each having a Band I and a Band III signal. The outlets have an isolation figure better than 20dB. A gain control is available on each channel so as to balance the Band I and Band III signals. The units may be connected in cascade if more than 12 outlets are required. The unit measures 10in. × 8½in. × 3½in. and weighs 6lb. Finished in green and gold and with a 9ft. three-core lead the price is £15 15s.—Wolsey Electronics Ltd., Cray Avenue, St. Mary Cray, Orpington, Kent.

Beethoven Model B.106

THE latest Beethoven model is shown here mounted on legs, which are an optional item available separately at 2 gns. This new receiver is a 17in. rectangular set with unbreakable window plate which may be removed easily for cleaning. A special high-efficiency video stage provides a contrasty picture which has resulted in the makers referring to the "black magic contrast," whilst the tuner with R.F. stage is known as the "miracle tuner." A.P.C. is fitted and also a circuit arrangement known as automatic focusing. With all-channel tuning, and designed for A.C./D.C. mains operation this receiver is listed at 68 gns. inclusive of purchase tax.—Beethoven Electric Equipment Ltd., 89, Reddish Lane, Gorton, Manchester 18.

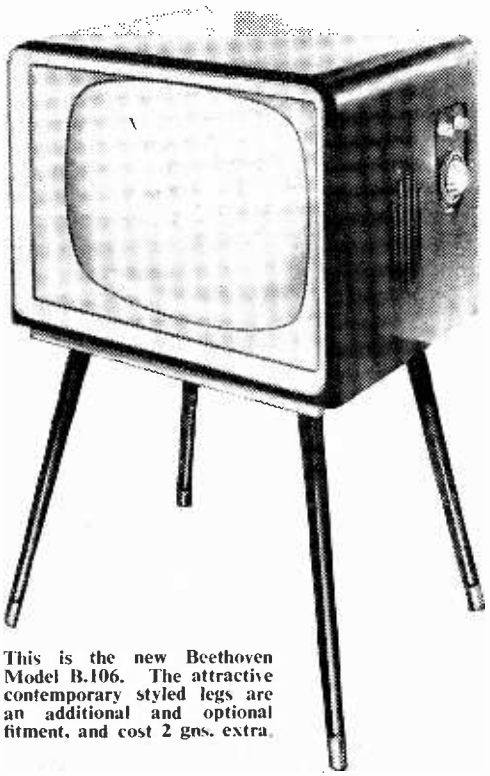
New J-Beam Aerial Range

J-BEAM AERIALS LTD., of Northampton, have just released a new range of aerials which are thought to be ideal for all locations due to their no compromise features and absence of side and rear pick-up.

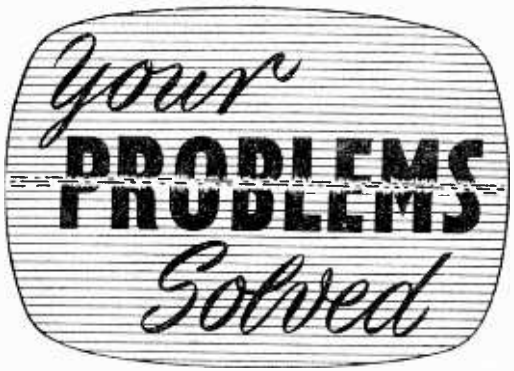
The Double Beam series is based on the skeleton slot principle which not only gives optimum gain and bandwidth on Band III, but excellent matching properties improving Band I performance.

The Double Beam range has been proved, by means of measured polar diagrams, to be completely free from compromise resulting in perfect performance on all bands.

Band II may be added with no derogatory effect to the TV channels, as each Band is completely isolated by the use of coaxial sections.—J-Beam Aerials Ltd., Northampton.



This is the new Beethoven Model B.106. The attractive contemporary styled legs are an additional and optional fitment, and cost 2 gns. extra.



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

PYE CW17

The picture is perfect until the set has been in operation for 30/45 minutes, distortion then becomes noticeable at the top of the screen to a depth of 1in. approx. The scan lines appear to spread apart, and they seem to be "pairing," the picture content in this area stretches upwards, and the verticals, bend off to the left. I have the circuit sheets for the set.—H. Finlock (Hythe).

We suggest you replace the PCF80 situated behind the mains input plug and the PL83 mounted on the right side of the chassis (V25 and V21.

BUSH TUG12A

The picture has collapsed to about 2in. wide. Unlike the reader whose letter you answered in May '57 issue the picture does not fade and disappear on advancing the brilliance control. When the width control is advanced a vertical bright line appears down the centre of the 2in. strip. I have had all valves in the line timebase tested and are O.K. I have no service sheet and only a small Pifco voltmeter. Can you help me by suggesting what tests to make and possible faults. I have made spark tests with an insulated screwdriver on the tube anode, EY51 both ends and top cap of line output valve and get satisfactory sparks. Also the width control appears O.K.—A. F. Hartland (Dagenham).

We would advise you to replace the 2μF capacitor wired in series with the line scanning coils.

FERGUSON 308T

I get what seems like a bad mains hum and off it goes. Sometimes it can be got back by operating the fine tuner or by turning the channel selector. When this fails it has to be switched off for a time. I have changed the PCL83 and EF80 but it remains the same. The picture is not affected by this fault.—G. R. Gray (Ilford).

We would suggest you test the PCC84 and PCF 80 valves in the tuner unit by substitution. We assume the PCL83 replaced is the left side upper sound A.F. and output valve. The right side PCL83 is, of course, the frame timebase part generator and output.

MURPHY TYPE V202C

During programmes the picture will suddenly disappear completely, leaving a thin line of very bright light across the centre of the screen. The fault can be remedied by quickly switching off and on again but the cure is not lasting. Could you please give me some indication of the cause of the trouble and possible means of correction? —R. J. Webb (E.12).

The frame timebase, which is your faulty section, is on the top left-hand wing as you look in from the back. The most likely components to check are the frame output valve 6P25, which is the largest valve on this deck, and the 6L1 frame oscillator, which is the uppermost valve on the rear edge. The coupling condenser gives a lot of trouble, too. This is a .25μF paper condenser which shares the same clip as the electrolytic which decouples the section and is underneath the 6P25.

PYE CONTINENTAL

At certain intervals line hold completely fails and cannot be locked by manipulation of line hold control. I have changed V24 horizontal osc. PCF80 and this has effected a lock though the picture still tends to pull to the right-hand side, and the line hold control is at the extreme end of its travel. Any slight rotation from this position gives a picture break up. I would be glad of any suggestion you may be able to give that will enable a good solid lock to be obtained. W. H. Hill (Wednesfield).

Check the condition of the M3 metal rectifiers which are employed in the discriminator circuit associated with the line synchronising circuits. It should be noted that the line hold control should be adjusted critically until a setting is established when the picture jumps quickly into line sync on removing and replacing the aerial.

PYE VT4

Picture and sound very good, but have to keep switching off set due to crackling and sparks from a resistor in the lead attached to the side of the tube.—James Unwin (Manchester).

The 82 KΩ resistor (value not critical) should be inspected, replaced if necessary and the connections remade. It is possible that the sparking may be caused by an internal short in the tube but this is, of course, only a possibility.

FERGUSON MODEL 306T

For periods of two to three weeks I get a good picture from Granada Channel 10, then for a similar period I receive just a shadow or wavy lines. The aerial is standard for this area, being an eight-element array. My BBC aerial is a flat "H" for Channel 5.

My neighbour has the same set and aerial, he receives a perfect picture for 90 per cent. of his

viewing time and has never completely lost the picture as I have. I have tried my set on his aerial during a bad period and received a very good picture (our aerials are on the same chimney).

I have one lead from the aerial to my set, my neighbour has two, with a box on the window sill to change over. Can this be the reason? I see from your article, "I.T.A. in the West," diplexers can be used where signals are strong; as we are on the fringe would you advise changing over to a double feeder?—Mr. S. Clark (Birmingham).

If a good crossover filter is used, such as the Belling & Lee "Diplexer," the loss is so small that it can be ignored. It often happens that the signal conditions fluctuate differently in fringe areas from one aerial to the next, even though they may be closely spaced; this is particularly true so far as Band III is concerned. We would suggest that you move your aerial to another chimney stack or as far as possible away from your neighbour's array. Height of the aerial above ground must not be lost, however, as this is one of the most important factors in fringe areas.

MURPHY V178C

My tube went and I put another in (CRM123), but since putting the tube in I can only get a light on the screen in the centre.

I have put a new EL38, a new U281 and a new U25 in the line transformer. I can get sound and line whistle.

On the top of my line transformer there are five tappings, three on on side and two on the other, but on the side with three tappings I can only get a reading on the two end ones. There is nothing on the middle one. Does this indicate something wrong in the line transformer? I cannot get any scan lines or a raster.—John Balderstone (Burnley).

The fact that you have light on your screen indicates that the line timebase is working and producing E.H.T. The centre tag on the top of the transformer should show 86 ohms to the EL38 anode, the other two are the scancoil winding.

We suggest you look for your fault in the scancoil assembly or the wiring leading thereto.

FERGUSON 978T

I followed your advice and had valve ECL80 checked (dealer says its O.K.), and replaced 470K resistor. The trouble still persists only now when switched on, the picture is very tall (not touching sides of screen), it then closes down leaving a gap top and bottom ¾in. and spreads out sideways filling the screen horizontally. The height and vertical hold controls still working together critically (height opened fully).

Should appreciate your further advice about this. I have checked the mains and the set is on the correct tapping.—E. Camball (Leamington Spa).

It is possible that the PZ30 rectifier is failing and this should be checked. A valve tester will not always reveal a faulty valve and substitution is sometimes the only reliable check, this also applying to the ECL80 valves.

If the bottom cramping persists, check the linearity components associated with the frame output ECL80 and if necessary change the 150 KΩ resistor to 75 K or even 50 KΩ.

EKCOVISION T221

The symptoms, a very dim picture which turns negative as brilliance is advanced. A well focused raster is obtainable though dim. I tried a 13.3v. transformer with 20 per cent. boost on tube without any real difference. EHT as near as a screwdriver can tell seems to be well up, jumped almost ¼in., and picture does not swell out. Tried moving ion trap magnet, disconnected A.G.C. lead and moving limiter plug without any difference. High reading on tube A1 but low on K and G. I have not got the service sheet yet.—C. F. Prior (Englefield Green).

The trouble you are having is undoubtedly your tube, which is one of those which cannot be improved by boosting. Before discarding it you may like to check the setting of your ion trap magnet, which may give you more light if moved from its present position.

We have in some cases slowly increased the heater voltage to as much as 30 volts in an attempt to burn off the contamination on the cathode. This is sometimes successful if done slowly with the set cold and a positive voltage applied to the grid (10v.), but there is a risk of blowing the filament so should not be tried until you are resigned to replacing your present tube.

FERGUSON 17in. TV MODEL 604T

Sound is normal. Picture rolls and vertical lock hold has little effect. Picture can be held by adjusting height control but is then two frames, and flickers. PCF80 sync separator and part frame oscillator and PCL83 part frame oscillator and frame output have been replaced with no effect.—L. V. Cahill (Co. Antrim).

Replace the OA71 frame sync shaper crystal diode which is probably defective. This is wired to pin 2 of the PCL83.

MURPHY CONSOLE

I have a Murphy built on the circular chassis principle (model number not known), and should be glad of your assistance.

At the present time the picture has good contrast but is very dull and will not fill the 12in. tube. Adjustment of the brightness brings up the raster with consequent loss of contrast and picture detail, and it is impossible to resolve a good black and white image at this degree of brightness. Only when the brightness is turned down can a very dull picture be obtained, with sufficient contrast.

I have recently replaced a faulty line control and also the line output valve (tested and found to have very little emission). I am of the opinion that the tube is running low, or failing altogether, and possibly you could help me by indicating what further tests I should make in order to

(*Continued on page* 297)

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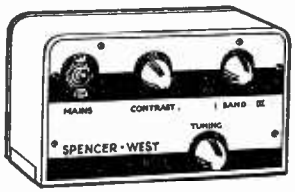

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restore the picture to its original brilliance. The tube is an Ediswan and is about five years old.—G. Alan Holt (Sheffield).

Your set is the V210C, and apart from your tube being low emission we suggest you have a faulty metal rectifier type RM4. This should deliver about 230v. D.C. from the same A.C. input and give an H.T. rail voltage of 205v.

The heater voltage to your tube can be increased by removing the wire feeding mains to the 2 volt transformer from the 200 volt tag of the voltage panel and connecting it to the rotating contact in the centre (assuming that your mains is 220v. or more).

K.B. MK100

The channel switch has become faulty, the picture flickers on and off, appearing like a loose connection as the switch is altered. I understand the trouble is caused by a loose spring in the channel switch. Could I make the adjustment so as to avoid a long wait for workshop service?—E. Sowerbutts (Bristol).

The tuner springs may be retensioned quite simply by slightly (and carefully) increasing the bow. This of course necessitates the removal of the bottom cover of the tuner unit. To increase the bow, insert a thin screwdriver blade between the end of the spring and the wall of the unit and very carefully apply pressure.

EKCO T310

A line fault has appeared about one-third from the bottom of the picture, as though two lines had merged together and fluctuates up and down that third of picture.—John Tait (Glasgow).

Your line bunching is due to B-K oscillations in the frame output stage. This can normally be cured by changing the valve, which is a 30PL1 located just below the scancoils against the seam which joins the timebase chassis to the I.F. strip. There is another 30PL1 working as sound output, and the two can be interchanged as an initial step in checking your set's performance.

ULTRA W721

When the set is first switched on the picture is good and bright. After about 30 minutes the picture goes dull and flat. Advancing the brightness control produces an upward flare on all the light spots on the screen. I have tried turning the aerial to reduce the flare without success.

Also a bright horizontal line appears on the bottom of the screen when the set has been on for 15 minutes or so.

I have a "Pifco" radiometer available and have very little experience of TV servicing but can follow a circuit diagram.—J. A. Moran (Morecambe).

From your description we would say that you have a low emission cathode ray tube, although it is unusual for this sort of tube to start bright and go dull. We suggest you measure the filament volts, which should be 2v., both when the set is working right and when it has gone faulty, as you may have a dry joint in the wiring which reduces the supply when warm. The horizontal line at the bottom of the screen can usually be cured by changing the UL46 frame output valve which is located just behind the line output stage cover.

PHILIPS 1100U

Would you please tell me what is wrong as the picture keeps on rolling? It does not matter which ECL80 valve I change (which I have about half a dozen), the rolling still persists, with about three pictures with flyback lines in the frame. It makes no difference which way I turn the frame hold.—D. J. Jones (Glam.).

You should replace the 2.2 megohm resistor wired in series with the hold control. This is located behind the socket on the side wall of the timebase chassis. If the picture tends to be flat, check also the 5.6 megohm associated with the vision limiter control.

EKCO MODEL T284

I should be pleased if you could give me any details, etc., to assist me in cleaning the tube of my set?—G. P. Elsworth (Carlisle).

First remove the chassis by disconnecting the leads to scancoils, tube base, loudspeaker assembly, and E.H.T. condenser, removing circlip and metal shields on knobs, plastic panel covering three side knobs and two screws holding rear flange of chassis to the wood. Chassis then withdraws backwards.

Lay cabinet on its face and undo four long 2BA nuts at the tube corners (mind you do not break the metrosil). Tube cradle then withdraws by a series of angular movements (lift, slide down, tilt out from top, slide up, rest on top of fixing bolts, tilt sideways, lift clear. Undo 4 × 4BA bolts holding glass and mask to tube cradle and lift tube cradle clear. (Clean and reassemble in reverse order, carefully re-fitting plastic strip around the mask join to exclude all air.)

K.B. MV30

No line osc. whistle so no EHT. Voltage tests O.K., also valve O.K. (12AU7). Could the fault be in sync sep. 12AX7?—R. Graham (Millom).

The sync separator would not be responsible You should have the 6U4GT valve tested and if this is in order the 6CD6G. We are not sure what you mean by "voltage tests O.K.," and would like a more detailed report before offering further advice.

QUERIES COUPON

This coupon is available until JANUARY 21st, 1958, and must accompany all Queries sent in accord with the notice on page 293.

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